BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Examine the Commission's Future Energy Efficiency Policies, Administration and Programs.	Rulemaking 01-08-028, (Filed August 23, 2001)

RESPONSE TO ALJ THOMAS'S RULING OF 6/17/2002 REGARDING EVALUATION, MEASUREMENT AND VERIFICATION OF LOCAL ENERGY EFFICIENCY PROGRAMS

EM&V Qualifications and Notification of Interest by XENERGY

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This submittal is in response to the Administrative Law Judge's Ruling Regarding Evaluation, Measurement, and Verification of Local Energy Efficiency Programs issued on June 17, 2002 (Rulemaking 01-08-028). Presented first are our responses to the bulleted items listed in the ruling, including the identification of Recipients and local energy efficiency programs for which we are interested in providing EM&V services, as well as several statements regarding our independence and potential conflicts-of-interest. We then provide a consolidated summary of our relevant EM&V qualifications, along with brief staff bios and resumes for XENERGY employees who would supervise work on EM&V projects.

1 RESPONSES TO BULLETED ITEMS

1.1 Identification of Recipient(s) and local energy efficiency programs for which the Contractor proposes to perform EM&V services

Table 1 presents a listing of the Recipients and local energy efficiency programs for which XENERGY is qualified for performing EM&V services. As shown, XENERGY is qualified to perform EM&V services on nearly all of the local energy efficiency programs being funded by Public Goods Charge (PGC) funds collected in 2002 and 2003. In this table, we also note whether or not the local funding recipient (Recipient) has named XENERGY as the recommended EM&V Contractor. Finally, we note that there are four programs where we indicate a conflict-of-interest based on this Rulemakings prohibition against self-evaluation: the two programs in which XENERGY is the program implementation prime contractor, and two others in which XENERGY is a major program implementation subcontractor.

1.2 An explanation of why the Contractor is independent of Recipient

Conducting independent evaluations has been one of XENERGY's principal core business areas for over fifteen years. XENERGY's program evaluations have been reviewed and accepted by the CPUC and ORA without exception over the past decade and have always met or exceeded CALMAC's impact evaluation protocol requirements.

As noted above, and in accordance with this Rulemaking, XENERGY does not propose to be considered as an EM&V Contractor for any program for which we are have a major

role in implementation (either as prime contractor or as subcontractor). XENERGY's ownership and business is completely independent of the Recipients implementing the remaining 72 programs listed in Table 1.

1.3 A list of all work the Contractor has done with or for the Recipient

To the best of our knowledge at the time of this submittal, Table 1 also presents a brief listing of all work between and Recipients.

1.4 Explanation of any factor that might lead a reasonable person to question whether the Contractor is actually independent of the Recipient

There are no factors that would lead a reasonable person to question XENERGY's independence of the Recipients.

1.5 A description of any reason why the Commission might not select the Contractor

XENERGY sees no reason why the Commission would not select our firm to provide EM&V services as listed in Table 1.

2 IDENTIFICATION OF POTENTIAL CONFLICTS-OF-INTEREST

XENERGY was selected to implement several local programs under R.01-08-028. In accordance with the requirements of this Rulemaking, the programs being implemented by XENERGY will not be evaluated by XENERGY. XENERGY sees no potential conflicts of interest associated with evaluating any of the programs that we are not implementing.

Table 1
List of Local Energy Efficiency Programs for which XENERGY is Qualified to be EM&V Contractor

Energy Division Proposal Reference Number	Proposal Sponsor	Program Title	XENERGY Listed as Recommended EM&V Contractor?	Previous Work for/with Recipient
118B-02	ADM Associates, Inc	Mobile Energy Clinic Program	No	ADM was subcontractor to XENERGY on 1992 gas energy efficiency potential study. ADM was subcontractor to XENERGY on 2001 DEER Update Study. ADM was subcontractor to XENERGY on 2001 Portland General Electric Commercial Program Evaluation.
119A-02	ADM Associates, Inc	Upstream High Efficiency Gas Water Heater Program	No	ADM was subcontractor to XENERGY on 1992 gas energy efficiency potential study. ADM was subcontractor to XENERGY on 2001 DEER Update Study. ADM was subcontractor to XENERGY on 2001 Portland General Electric Commercial Program Evaluation.
142AB-02	Alliance to Save Energy	Green Schools, Green Communities	Part of Ridge & Associates team	Nonresidential SPC Evaluation (SCE), California Residential Lighting and Appliance Program Evaluation (SDG&E)
171AB-02	American Synergy Corporation	Comprehensive Hard-to-Reach Residential and Small Commercial Energy Savings Program	Yes	None
201-02	American Synergy Corporation	Comprehensive Hard-to-Reach Mobile Home Energy Savings	Yes	None
244-02	ASW Engineering	The Energy Savers Program	No	None
172-02	California Building Performance Contractors Association	Comprehensive Whole-House Residential Retrofit Program	No	None

Energy Division Proposal Reference Number	Proposal Sponsor	Program Title	XENERGY Listed as Recommended EM&V Contractor?	Previous Work for/with Recipient
311BC-02	California State University Chancellor's Office	California State University Energy Efficiency Program Proposal	No	None
230ABCD-02	California State University Fresno	Agriculture Pumping Efficiency Program	No	None
162ABC-02	California Urban Water Conservation Council	Pre-Rinse Spray Head Installation Program for the Food Service Industry Proposal	No	None
234A-02	CHEERS	Building Department and Small Builder Title 24 Standards Training	No	None
116-02	City of Davis	Davis Comprehensive Energy Efficiency Program (DCEEP)	No	None
284-02	City of San Diego	Whole House Energy Retrofit Incentive Program	No	None
203-02	City of Stockton / InSync	Stockton Area Comprehensive Local Proposal	Yes	None
156-02	County of Los Angeles	The County of Los Angeles Internal Services Division Energy Efficiency Program	No	None
292-02	D&R International	Appliance and Lighting Products in Residential New Construction	Yes	None
99-02	Ecology Action of Santa Cruz	Small Business Energy Efficiency Program	Yes	None
245C-02	Ecos Consulting	LiteVend Program	Possibly (decision in progress at time of this submittal)	Ecos is subcontractor to XENERGY on a Lighting Baseline Program Study being conducted for BC Hydro.

Energy Division Proposal Reference Number	Proposal Sponsor	Program Title	XENERGY Listed as Recommended EM&V Contractor?	Previous Work for/with Recipient
258BC-02	Ecos Consulting	Energy Star CFL Program for Small Hardware and Grocery Retailers	Possibly (decision in progress at time of this submittal)	Ecos is subcontractor to XENERGY on a Lighting Baseline Program Study being conducted for BC Hydro.
274-02	Efficiency Services Group Inc	Energy and Water Saving Program for Residential Rental Properties in Targeted Local Communities in PGE Service Area	No	None
141ABC-02	Electric & Gas Industries Association	A Proposal to Develop & Administer an Interest Rate Buy-Down for the Installation of High Efficiency HVAC Equipment	No	None
208-02	Energx Controls Inc	Local Small Commercial Energy Efficiency & Market Transformation Program	No	None
98AB-02	Energy Analysis Technologies	Residential Duct Services Program	No	None
232A-02	Energy Coalition	The Energy District Approach for Sustainable Energy Efficiency in California	Possibly (decision in progress at time of this submittal)	None
148ABC-02	Energy Solutions	LightWash	Yes	Energy Solutions is subcontractor to XENERGY on our CEC Demand Response Program Marketing Support Project. Energy Solutions provided an analysis of efficiency potential in the office equipment end use under subcontract to XENERGY as part of our California Commercial Energy Efficiency Potential Study (PG&E/CALMAC)

Energy Division Proposal Reference Number	Proposal Sponsor	Program Title	XENERGY Listed as Recommended EM&V Contractor?	Previous Work for/with Recipient
243ABC-02	EnSave Energy Performance Inc	California Variable Speed Drive Farm Program	No	None
113-02	Fisher-Nickel Inc	Energy Efficiency in Commercial Food Service	No	None
126-02	Frontier Associates	Green Building Technical Support Services	No	None
180-02	GeoPraxis	Time-of-Sale Home Inspection Proposal	No	None
130-02	Geothermal Heat Pump Consortium	Proposal to Promote Geoexchange to SCE Customers	No	None
248B-02	Global Energy Partners, LLC	Energy Efficiency Services for Electricity Consumption and Demand Reduction in Oil Production in the State of California	No	None
278BC-02	Global Energy Services	Chinese Language Efficiency Outreach (CLEO)	No	None
255CD-02	Heschong Mahone Group	Efficient Affordable Housing Program	Yes	None
134-02	ICF Associates Inc	Partnership for Energy Affordability in Multi-Family Housing	Yes	PIER Technical Support Contract (CEC)
218AB-02	ICF Associates Inc	Demand Control Ventilation Pilot Program	Yes	PIER Technical Support Contract (CEC)
184AB-02	Local Government Commission	Regional Energy Authority Pilot Projects	No	None
237ABC-02	PECI	Proposal for Delivering Energy Efficiency Services to Local Independent Grocery Sector	No	None

Energy Division Proposal Reference Number	Proposal Sponsor	Program Title	XENERGY Listed as Recommended EM&V Contractor?	Previous Work for/with Recipient
02-Nov	PG&E	School Resources Program	Part of Ridge & Associates team	XENERGY has conducted numerous program evaluation and market assessment studies for PG&E over the past 10 years. In the past 3 years, XENERGY has implemented PG&E's direct mail audit program, as well as provided minor nonresidential implementation technical support services (primarily large C&I audits).
15-02	PG&E	Energenius	Part of Ridge & Associates team	XENERGY has conducted numerous program evaluation and market assessment studies for PG&E over the past 10 years. In the past 3 years, XENERGY has implemented PG&E's direct mail audit program, as well as provided minor nonresidential implementation technical support services (primarily large C&I audits).
19-02	PG&E	Pacific Energy Center (PEC)	No	XENERGY has conducted numerous program evaluation and market assessment studies for PG&E over the past 10 years. In the past 3 years, XENERGY has implemented PG&E's direct mail audit program, as well as provided minor nonresidential implementation technical support services (primarily large C&I audits).
290-02	Proctor Engineering Group Ltd.	Check Me	No	None

Energy Division Proposal Reference Number	Proposal Sponsor	Program Title	XENERGY Listed as Recommended EM&V Contractor?	Previous Work for/with Recipient
106-02	Quantum Consulting Inc	Municipal Wastewater Retro-Commissioning (PG&E Territory)	Yes	Quantum has been a subcontractor to XENERGY on PG&E's Express Market Transformation Study, Small Nonresidential Market Effects Study, Process Overhaul Evaluation, Statewide Small Nonresidential Sector Program Evaluation, and 1-2-3 Cashback Evaluation. XENERGY was subcontractor to Quantum on a PG&E Commercial Process Impact Evaluation, a Statewide Manufactured Housing Characterization Study, and the BEMS and Smarter Energy Market Effects Study. XENERGY is also an implementation subcontractor on Quantum's Oakland Partnership Program.
107-02	Quantum Consulting Inc	Municipal Wastewater Retro-Commissioning (SCE Territory)	Yes	Quantum has been a subcontractor to XENERGY on PG&E's Express Market Transformation Study, Small Nonresidential Market Effects Study, Process Overhaul Evaluation, Statewide Small Nonresidential Sector Program Evaluation, and 1-2-3 Cashback Evaluation. XENERGY was subcontractor to Quantum on a PG&E Commercial Process Impact Evaluation, a Statewide Manufactured Housing Characterization Study, and the BEMS and Smarter Energy Market Effects Study. XENERGY is also an implementation subcontractor on Quantum's Oakland Partnership Program.
174-02	Quantum Consulting Inc	The Oakland Energy Partnership Program	N/A (XENERGY is Program Implementation subcontractor)	N/A

Energy Division Proposal Reference Number	Proposal Sponsor	Program Title	XENERGY Listed as Recommended EM&V Contractor?	Previous Work for/with Recipient
179-02	Richard Heath & Associates, Inc.	Proposal to Provide A Small Nonresidential Energy Fitness Program	Yes	None
287-02	Richard Heath & Associates, Inc.	Mobile Home Energy Efficiency & Education Program	Yes	None
182AB-02	Rita Norton & Associates	South Bay Communities & Affiliates Energy Efficiency Program	Yes	None
125-02	RLW Analytics Inc	The Energy Savers Program	No	None recently. RLW was subcontractor to XENERGY on 1992 PG&E CIA Impact Evaluation.
300-02	San Diego Regional Energy Office	San Diego Public Agency Information and Technical Support Program	No	None. XENERGY is implementation subcontractor to SDREO on the SDREO DISC Program.
301-02	San Diego Regional Energy Office	San Diego Region Energy Resource & Education Center	No	None. XENERGY is implementation subcontractor to SDREO on the SDREO DISC Program.
303-02	San Diego Regional Energy Office	San Diego Region Cool Communities Shade Tree Program Proposal	No	None. XENERGY is implementation subcontractor to SDREO on the SDREO DISC Program.
304-02	San Diego Regional Energy Office	San Diego Region Agriculture, Water and Energy Program	No	None. XENERGY is implementation subcontractor to SDREO on the SDREO DISC Program.
305-02	San Diego Regional Energy Office	San Diego Region Direct Install Small Commercial Program	N/A (XENERGY is Program Implementation subcontractor)	N/A
306-02	San Diego Regional Energy Office	San Diego K-12 Energy Education Program	Part of Ridge & Associates team	None. XENERGY is implementation subcontractor to SDREO on the SDREO DISC Program.
97A-02	SBW Consulting, Inc.	Compressed Air Management Program	No	None

Energy Division Proposal Reference Number	Proposal Sponsor	Program Title	XENERGY Listed as Recommended EM&V Contractor?	Previous Work for/with Recipient
37-02	SCE	Residential In-Home Energy Survey Program	No	XENERGY has conducted many program evaluation and market assessment studies for SCE over the past 10 years. In the past 3 years, XENERGY has implemented SCE's direct mail audit program, and developed internet audit and 20/20 analysis tools.
40-02	SCE	Small Nonresidential Hard to Reach Program	No	XENERGY has conducted many program evaluation and market assessment studies for SCE over the past 10 years. In the past 3 years, XENERGY has implemented SCE's direct mail audit program, and developed internet audit and 20/20 analysis tools.
42-02	SCE	Pump Tests & Hydraulic Services Program	No	XENERGY has conducted many program evaluation and market assessment studies for SCE over the past 10 years. In the past 3 years, XENERGY has implemented SCE's direct mail audit program, and developed internet audit and 20/20 analysis tools.
43-02	SCE	Demonstration & Information Transfer	No	XENERGY has conducted many program evaluation and market assessment studies for SCE over the past 10 years. In the past 3 years, XENERGY has implemented SCE's direct mail audit program, and developed internet audit and 20/20 analysis tools.
44-02	SCE	Local Government Initiative	No	XENERGY has conducted many program evaluation and market assessment studies for SCE over the past 10 years. In the past 3 years, XENERGY has implemented SCE's direct mail audit program, and developed internet audit and 20/20 analysis tools.

Energy Division Proposal Reference Number	Proposal Sponsor	Program Title	XENERGY Listed as Recommended EM&V Contractor?	Previous Work for/with Recipient
45-02	SCE	Codes & Standards Program	No	XENERGY has conducted many program evaluation and market assessment studies for SCE over the past 10 years. In the past 3 years, XENERGY has implemented SCE's direct mail audit program, and developed internet audit and 20/20 analysis tools.
83-02	SCG	Nonresidential Financial Incentives Program	No	In the past three years, XENERGY has implemented SCG's direct mail audit program.
84-02	SCG	Diverse Markets Outreach Program	No	In the past three years, XENERGY has implemented SCG's direct mail audit program.
63-02	SDGE	Hard to Reach Lighting Turn In Program	No	XENERGY has conducted many program evaluation and market assessment studies for SDG&E over the past 10 years. In the past 3 years, XENERGY has implemented SDG&E's residential direct mail audit program, and a small-scale nonresidential ENERGY STAR office equipment program.
64-02	SDGE	In-Home Audits Program	No	XENERGY has conducted many program evaluation and market assessment studies for SDG&E over the past 10 years. In the past 3 years, XENERGY has implemented SDG&E's residential direct mail audit program, and a small-scale nonresidential ENERGY STAR office equipment program.
65-02	SDGE	Small Business Energy Assessments	No	XENERGY has conducted many program evaluation and market assessment studies for SDG&E over the past 10 years. In the past 3 years, XENERGY has implemented SDG&E's residential direct mail audit program, and a small-scale nonresidential ENERGY STAR office equipment program.

Energy Division Proposal Reference Number	Proposal Sponsor	Program Title	XENERGY Listed as Recommended EM&V Contractor?	Previous Work for/with Recipient
66-02	SDGE	EZ Turnkey Program	No	XENERGY has conducted many program evaluation and market assessment studies for SDG&E over the past 10 years. In the past 3 years, XENERGY has implemented SDG&E's residential direct mail audit program, and a small-scale nonresidential ENERGY STAR office equipment program.
70-02	SDGE	Codes and Standards	No	XENERGY has conducted many program evaluation and market assessment studies for SDG&E over the past 10 years. In the past 3 years, XENERGY has implemented SDG&E's residential direct mail audit program, and a small-scale nonresidential ENERGY STAR office equipment program.
197-02	SESCO, Inc.	The Gas-Only Multi-family Gas Program	No	None
177-02	State & Consumer Services Agency	Proposal for a Local K-12 Schools Energy-Efficiency Program	Part of Ridge & Associates team	None
144AB-02	Xenergy	Energy Efficient Local Government Partners Program	N/A (XENERGY is Program Implementer)	N/A
202AB-02	Xenergy	Comprehensive Compressed Air Program	N/A (XENERGY is Program Implementer)	N/A

3 XENERGY QUALIFICATIONS

XENERGY Inc. is an international leader in planning, design, management, and evaluation of energy efficiency programs. Since the firm's establishment in 1975, XENERGY has developed, delivered, and assessed the results of hundreds of programs to improve energy efficiency in the residential, commercial, industrial, and agricultural sectors. We have conducted this work on behalf of electric and gas utilities, government agencies, and regulators in the United States, Canada, and over a dozen other countries. XENERGY is unique among firms active in the energy efficiency industry in that we have extensive and comprehensive experience in all stages of the program life cycle: technical and market potential assessment, market analysis, planning, implementation, and evaluation. This diversity of experience and knowledge allows us to provide maximum value to our clients no matter how broad or focused the assignment.

This section contains a summary of XENERGY's qualifications for providing energy efficiency program evaluation, measurement and verification support. XENERGY is an international leader in energy program evaluation. We have pioneered a number of new methods and have also carried out many of the most important evaluation studies in the industry. We also have designed and conducted a large number of successful market assessment, baseline, and market research studies over the past five years, covering both the residential and nonresidential market segments. This breadth and depth of experience and expertise provide us with a unique understanding of energy efficiency product and market trends. A summary of our relevant experience and capabilities is provided below.

3.1 Residential Energy Efficiency Program Evaluation Experience

3.1.1 Process and Impact Evaluation of California's Low Income Energy Efficiency (LIEE) Program

XENERGY is currently undertaking both process and impact studies of California's 2001 LIEE Programs on behalf of the four investor-owned utilities. XENERGY recently completed process and impact evaluations of the State's 2000 LIEE Programs. The process evaluation for the 2000 programs focused on identifying areas of best practice

across the four utilities by program element, which could be used by the utilities as benchmarks for future efforts. Data collection activities included in-depth interviews with LIEE program utility staff, administrative contractors, and community-based organizations and private implementation contractors. We have also toured the utility's training facilities and conducted several "ride along" site-visits to assess the applications of program policies and procedures in the field. In addition, we have conducted telephone interviews with program participants to assess customer satisfaction.

The 2000 impact evaluation consisted of a billing analysis that provided the utilities with first-year impacts of the PY2000 program. The 2001 impact evaluation also includes a billing analysis that will provide first-year impacts for the PY2001 program for measures offered through the regular LIEE program and for Rapid Deployment measures.

3.1.2 Evaluation of California's Residential Lighting and Appliance Program

XENERGY recently completed the fourth and final phase of the California Residential Lighting and Appliance Market Effect Study. The purpose of the four-phased study was to evaluate the effectiveness of statewide interventions in residential lighting and appliance markets. In Phase 1, the objectives were to measure key baseline market indicators and characterize the market for the qualifying technologies. In Phase 2, the objective was to document the history and evolution of the program and modify (as necessary) the program theory and direction for subsequent evaluation phases. In Phases 3 and 4, the evaluation team tracked progress for several key market indicators and compared them to the baseline (Phase 1) results.

Research efforts in support of the project consisted of characterization of the market for lighting equipment and appliances, development of descriptions of utility and other major energy efficiency programs and campaigns, and primary data collection. The initial market characterization and program descriptions were developed initially early on in the project, and were updated during the last phase. Major data collection activities were undertaken throughout all phases of the project, supporting the determination of market indicators and the development of market effects. Primary data collection consisted of

numerous consumer surveys, mystery shopper survey, and retailer and manufacturer in-depth interviews.

3.1.3 1-2-3 Cashback Evaluation

Through this study, PG&E seeks to assess the effectiveness of each element of its 1-2-3 Cashback campaign in bringing about customer behavior changes, ranging from simple, energy-saving practices to more substantial investments in energy-efficiency measures. The first step in this evaluation will be to assess the nature and frequency of energy-efficiency practices/actions taken in the population. Next, the XENERGY team will assess attribution of these behaviors through several methods, including an analysis of self-reported data, simple comparisons between participants and nonparticipants, and more complex statistical modeling.

3.1.4 PG&E ENERGY STAR® Awareness Study

XENERGY conducted an ENERGY STAR® awareness tracking study on behalf of PG&E to assess the effectiveness of its ENERGY STAR® mass media advertising campaign. The campaign was launched in early September 2000 and ran through November 25, 2000. The survey of PG&E's residential and small business customers was conducted in two waves, a pre-campaign baseline survey that was conducted during the last two weeks of August 2000, and a follow-up survey that was completed in late November- early December 2000.

3.1.5 National ENERGY STAR® Awareness Study

Under subcontract to Cadmus, XENERGY analyzed survey data collected by the Consortim for Energy Efficiency (CEE) on nationwide household recognition and understanding of the Energy Star label. The analysis addressed awareness of the label, recognition with and without prompt, understanding of the label's message, and the influence of the label on purchase decisions. Analysis of the second round of the survey, conducted in 2001, compared two different survey modes (mail and webTV) as well as comparing the new results with those of the previous year. XENERGY also provided assistance to CEE in designing the samples to take advantage of regional survey efforts utilizing the same survey instrument.

3.1.6 Evaluation of the ENERGY STAR® Labeling Programs

XENERGY performed an evaluation of the market effects and energy impacts of three ENERGY STAR® components: the office equipment labeling program, the residential HVAC program, and the general recognition and communication campaign.

3.1.7 CBEE Baseline Study on Energy Efficiency Attitudes and Awareness

XENERGY staff managed a comprehensive study to assess baseline levels of residential customer awareness and attitudes toward energy efficiency. The purpose of this study was to conduct a comprehensive, statewide survey of residential customers in order to provide a foundation for achieving two fundamental objectives: (1) help lay the groundwork for analyzing and tracking awareness and attitudes toward residential energy efficiency products and services promoted through California programs, and (2) provide input for program design and selection decisions.

The study measured the baseline level of energy efficiency awareness in California in general as well as for key areas of knowledge. It also addressed the extent to which awareness and attitudes are correlated with specific market events. The study further examined the remaining barriers to and potential for developing new energy efficiency programs, and provided recommendations for increasing customer awareness of energy efficiency, influencing energy efficiency decisions, developing new energy efficiency programs. In addition to addressing these research questions, the study provided recommendations for carrying out future tracking and performance measurement research. These recommendations addressed some key issues involved in tracking changes in dimensions of customer energy efficiency awareness, attitudes, perceptions, and actions/purchases over time.

3.1.8 Residential Market Effects Study on Refrigerators and CFLs

XENERGY staff managed a comprehensive study for PG&E and SDG&E focusing on refrigerators and CFLs. The primary purpose of this study was to assess the extent to which PG&E's and SDG&E's Residential Appliance Efficiency Incentive (RAEI)

Programs had transformed the residential market for CFLs and energy efficient refrigerators. Through this study, XENERGY staff gathered and analyzed data to assess the changes in the market for these two technologies, examined evidence that SDG&E's and PG&E's programs created those market effects, and looked for indications that the effects are long-lasting. The change in market share (for both CFLs and refrigerators) was examined in greater detail through this study. In addition, this study included a net-to-gross study of the 1996 High Efficiency Refrigerator Program (PG&E and SDG&E) and the 1996 High Efficiency Lighting Program (SDG&E).

3.1.9 Residential Energy Management Services Evaluation

XENERGY contributed to the evaluation of PG&E's 1998 Residential Energy Management Service Program (REMS). This multi-faceted program was designed to provide the residential sector with information on energy efficiency, including single family energy audits, which were performed over the phone through PG&E's Smarter Energy Line (SEL), by mail, or on-site by PG&E personnel. In addition, the 1998 REMS program included multifamily property energy management on-site audits and Energenius, a series of educational materials on energy efficiency, safety, and the environment for students in grades 1–8. An additional component of the 1998 REMS program included providing energy efficient product information to residential customers and to vendors, manufacturers, and sales personnel who produce or sell energy efficient technologies for the residential market.

The two main objectives of the evaluation were to (1) create a comprehensive market baseline characterization and (2) assess the near-term market effects of the 1998 REMS program. The market baseline was intended to enable future market effects studies of the REMS program to accurately measure market effects. The market effects analysis was necessary to analyze the near-term effects of the 1998 program. Since no baseline existed prior to this study, the market effects study estimated effects by using historical data and survey techniques.

3.1.10 Residential Retrofit Program Evaluation

XENERGY performed the impact evaluations for PG&E's 1994, 1995, and 1996 comprehensive residential retrofit programs. Engineering, billing, and net-to-gross analyses were performed to develop gross and net impacts for appliance efficiency, weatherization, energy management, and low income programs.

3.1.11 Multi-Family Properties Program Evaluation

XENERGY conducted a comprehensive process and impact evaluation of PG&E's 1993 Multi-Family common area audit and rebate program. The impact portion of the evaluation included on-site surveys (including monitoring of lighting fixtures), engineering analysis, net-to-gross analysis, and billing analysis using SAE models. The net-to-gross study included analyses of customer survey responses and observed measure penetrations. Subsequently, XENERGY was selected to evaluate impacts for this program for the 1994-1997 program years.

3.1.12 Residential Direct Assistance Program Evaluation

XENERGY performed impact evaluations of SCE and PG&E's Direct Assistance (Low Income Energy Efficiency) Programs. These evaluations were conducted over various program years (1994-1996). Key measures evaluated were CFLs, evaporative coolers, and weatherization. Billing analyses were used to develop weatherization and evaporative cooler savings, and were supported by telephone survey data. CFL savings were analyzed using a calibrated engineering approach. On-site surveys were performed to support the engineering analysis. The surveys consisted of multiple components, including: measure verification, customer interviews to ascertain CFL operating hours and net-to-gross issues, and the installation of lighting loggers to validate and calibrate the customer-reported operating hours estimates.

3.1.13 "A Better Idea Program" Process and Impact Evaluation

XENERGY conducted a process and impact evaluation for this residential neighborhood blitz program offered by the LADWP. The program's savings goals were 119 GWh and 23 MW. In addition, customer satisfaction and a positive perception of the utility were

two other important goals of the program. The impact evaluation of this large-scale comprehensive program included a combination of billing analysis, metering, and developing engineering estimates. XENERGY's newly developed data logger, *energy Eye*, was used in the evaluation. A full-scale process evaluation was also conducted, including the use of state-of-the-art customer satisfaction modeling techniques.

3.1.14 Residential HVAC Rebate Program Impact Evaluation

XENERGY estimated the impacts for SCE's rebate program meant to encourage the purchase of high efficiency central air conditioning and evaporative coolers. The main tool was a cross-sectional time series model that allowed for the separation of overall and incremental impacts using billing and survey data. XENERGY successfully isolated incremental effects for equipment replacers by month both inside and outside the program. The evaluation included the estimation of self-selection correction terms and the calculation of net-to-gross ratio factors using nested logit discrete choice models.

3.1.15 Effects of Rebates and Loans on Customers' Choice of Efficiency Level for Appliances

XENERGY served as subcontractor on this project, developing the data collection and analysis methods. The study examined efficiency choices in four situations: (1) purchases by residential customers of air conditioners, refrigerators, and lighting, (2) purchases by commercial customers of HVAC and lighting systems, (3) design choices by builders of new single-family houses regarding air conditioning, ducts, windows, and trees, and (4) design choices in commercial construction regarding air conditioning and lighting. Analysis was performed on a combination of "stated-preference" data (that is, choices that decision- makers said they would make in hypothetical, conjoint-type setting described in a questionnaire) and "revealed-preference" data (that is, their actual choices in the real world). The analysis estimated decision-makers' responses to each aspect of loans, such as interest rate, amount loaned, and repayment period, as well as the response to loans relative to rebates. Models were developed that predict the choice of efficiency level under various scenarios, such as: (i) no DSM programs, (ii) rebates programs with different levels of rebates, (iii) loan programs replacing the rebate programs, and (iv) loan programs offered in addition to rebate programs. The analysis has been submitted to

SCE's regulator as verification of the impact of SCE's past rebate programs, and is being used by SCE to design future loan programs

3.1.16 Residential New Construction Program Impact Evaluation

XENERGY performed the impact evaluations for PG&E's residential new construction program for the 1996 and 1998 program years. Data collection for the evaluation consisted of detailed on-site surveys of 315 homes, including "duct blaster" duct testing for a subset of 160 homes, and telephone builder surveys of key residential builders in the PG&E area. A cluster sample design was used to minimize survey costs. Program energy impacts were developed through the use of engineering and statistical models, including Micropas building simulations for each home in the study.

3.1.17 Residential New Construction Impact & Process Evaluation

XENERGY conducted an impact and process evaluation of the Salt River Project's Climate Crafted Home program. The impact evaluation involved approximately 100 on-site surveys, an analysis of hourly load research data, engineering simulation modeling, and an analysis technique known as Statistically Adjusted Engineering (SAE) models. The process evaluation involved staff and builder interviews.

3.2 Commercial and Industrial Energy Efficiency Program Evaluation Experience

3.2.1 Commercial Lighting Market Effects Study

In this landmark study, XENERGY examined the extent of market barrier reduction for selected lighting technologies addressed by PG&E and SDG&E's programs between 1992 and 1996. The study utilized 150 supply-side actor interviews along with 900 customer surveys to comprehensively assess whether lasting changes have occurred with respect to a variety of barriers. The project developed detailed characterizations of the both the supply and demand sides of the commercial lighting markets in the sponsors' territories. These characterizations detailed segmentations, estimates of the size of the total market and the key segments and identification of the key motivations and barriers

faced by denizens of those segments in regard to promoting or purchasing efficient lighting products. The study also included a retrospective analysis of program market effects on both the supply and demand side. Research for the project included over 200 in-depth interviews with supply-side market actors and extensive customer surveys.

3.2.2 Statewide Nonresidential Standard Performance Contract Program Evaluation

California's statewide Nonresidential Standard Performance Contract Program was developed in late 1997 mainly to transform the market by increasing the amount of sustainable business conducted between third-party energy-efficiency service providers (EESPs) and end users. It was, and is, administered by all California investor-owned electric utilities (PG&E, SCE, SDG&E), under the auspices of the California Public Utilities Commission (CPUC).

Over time, it has taken on more of a resource acquisition focus, providing cost-effective net energy savings and, in 2000 and 2001, peak demand reductions. From the program's inception, XENERGY has conducted regular evaluations that included interviews of customer and EESP participants, characterizing how the program worked, estimating net-to-gross ratios, and reviewing and integrating the results of utility tracking, monitoring and measurement activities. XENERGY produced multiple reports over time, namely: the 2000/2001 Nonresidential Large SPC Evaluation Study; the Statewide 1999 Large Nonresidential SPC Program Evaluation Study; and, the SCE/CBEE 1998 Nonresidential Standard Performance Contract Program Evaluation Study.

3.2.3 Nonresidential SPC Program M&V Case Studies

In this project, in-depth case study summaries were developed for 1998 NSPC/1999 LNSPC projects. The in-depth case studies documented the entire project development and program participation process, with a focus on the M&V aspect in particular. The case studies featured detailed project descriptions, summaries of proposed and revised M&V plans, documentation of actual M&V implementation activities and costs, analyses of actual M&V results and comparison to originally estimated savings, and assessment of EESP, customer, and utility reaction to and use of actual M&V results.

3.2.4 Statewide Small/Medium Nonresidential Study

This study provides a comprehensive assessment of incentive programs (Express Efficiency and Small Business SPC) and baseline markets for customers <500 kW. The findings are based on hundreds of interviews with key end user and supply-side market actors. Results are analyzed by customer class, business type, and customer size.

3.2.5 Express Efficiency Program Market Transformation Study

Through the Express Efficiency Program, PG&E provides nonresidential customers with prescriptive rebates for installing energy-efficiency measures. XENERGY characterized the market, identifying market barriers, and documenting market effects of this program, utilizing in-depth interviews with supply-side actors and structured surveys of small- and medium-sized commercial and industrial (C&I) customers.

3.2.6 Evaluation of Portland General Electric's Commercial Retrofit Programs

XENERGY conducted this evaluation of PGE's 1994-1995 programs, including retrofit billing analysis, sample design, analysis of program tracking and billing data, survey instrument development, and econometric modeling. The evaluation method involved several innovations such as conducting on-site visits for sites with relatively high expected energy savings and for sites that had unexplained changes in their energy usage over time. The evaluation results were presented to PGE's E&V Steering Committee.

3.2.7 Pacific Northwest Evaluation Collaborative for Commercial Buildings

XENERGY designed and implemented an innovative evaluation approach to assess the savings for a commercial new construction program that was implemented by several utilities in the Northwest. The project consisted of 400 on-site surveys, monitoring, engineering analysis, estimation of adoption models for net-to-gross analyses, econometric modeling, strategic short-term monitoring, and various billing analyses.

3.2.8 Impact Evaluation of Industrial Retrofit Program

XENERGY evaluated PG&E's 1994, 1997, and 1998 Industrial Retrofit Programs. These three studies involved performing numerous site-specific studies of various industrial processes and end uses. The results from the site studies along with surveys on customer decision-making process were used to determine the energy and peak demand savings from the program. The site studies required on-site data collection technology characteristics, and equipment operation, equipment monitoring, engineering analysis and modeling. XENERGY was responsible for all aspects of the study including the overall design, sample design, data collection methods, customer recruitment, and analysis.

Under separate contract, XENERGY also conducted retention studies for PG&E's Industrial Retrofit Programs (1994-1997). In these studies, on-site surveys were used to collect measure retention data for the process and indoor lighting end uses. An effective useful life (EUL) analysis was carried out using these data. A number of different survival functions were investigated as part of the analysis.

3.2.9 Process Overhaul Program Evaluation

This study provides an assessment of this PG&E program, which was designed to transform the market for energy-efficient process overhauls in the commercial, industrial, and agricultural sectors. This study focuses on the information and education elements of the program directed at selected applications: compressed air systems, motors/drives, process water treatment, packaged HVAC, industrial boilers, and industrial/commercial refrigeration.

3.2.10 Industrial Energy Efficiency Incentives Program Impact Study

XENERGY conducted impact evaluations for SDG&E's 1994-1997 Industrial Energy Efficiency Incentives Programs. In these evaluations, site specific analysis and net-to gross analysis were conducted for an average of about 20 industrial process measures installed at 13 sites each program year. An engineering approach supported by metering was utilized to develop gross impacts, and a self report net-to-gross analysis was utilized to determine the net impacts.

3.2.11 Industrial Lighting Impact Evaluations

XENERGY conducted industrial lighting impact evaluations for SDG&E (1996, 1997). These projects included detailed inventory at about 50 sites per year and time-of-use monitoring at the large industrial sites in each year (about 20 sites per year). A self-report net-to-gross analysis was conducted to develop net impacts.

3.2.12 Impact Evaluation of Portland General Electric's Industrial Programs

XENERGY conducted three separate impact evaluation studies for PGE each covering 2 years of program activities (1994-1999). The studies each involved conducting site-specific studies of energy savings for a wide range of technologies and practices. XENERGY also conducted various telephone surveys to collect data on operation hours and on the customer decision-making process. The projects required engineering analysis, on-site data collection, telephone surveys, sample design and statistical analysis. The results form each study were presented to PGE's E&V Steering Committee for the purpose of capturing shareholder incentives and lost margin.

3.3 Other Experience Relevant to Energy Efficiency Program Evaluation

3.3.1 2001 Update to California Measure Costs and Residential Energy Savings

The Statewide 2001 Database for Energy Efficiency Resources (DEER) Update Study provides estimates of energy savings and peak load impacts for residential energy-efficiency measures and estimates of full and incremental costs for currently available residential and commercial technologies and energy-efficiency measures. This study represents the third update to the original 1992 Measure Cost Study (XENERGY, 1992) and the first update of the residential energy savings estimates developed in 1994 (NEOS, 1994). These California measure cost studies are the most comprehensive and complete measure cost studies conducted in the United States. The key purpose of this study is to create a common set of cost and savings data across the state's major utilities to improve the consistency of information and assumptions used in energy-efficiency analyses. Energy savings estimates for the residential measures were developed with engineering

spreadsheet analyses or with DOE-2 simulations, depending on the characteristics of the measure. DOE-2 simulations were conducted for 59 measures for single-family homes and 51 measures for multi-family homes across 5 unique prototypes, 10 climate zones, and 4 vintages. Measure costs were estimated using over 8,000 cost quotes collected from distributors, contractors, and retailers throughout California. Cost data were collected from 318 sources. Cost estimates were segmented based on a number of characteristics, including distribution channel, volume, vintage, size, and efficiency. Recommendations for future work are provided.

3.3.2 2001 California Commercial Sector Energy-Efficiency Potential Study

The objective of this study is to identify and estimate the amount of cost-effective electric savings potential in the nonresidential sector for Pacific Gas & Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company. This study is the first comprehensive update of remaining energy-efficiency potential in California since the early 1990s. Savings potentials are being developed by utility and by market segment. In addition to traditional building type, a key market segment of interest is customer size. Several estimates of potential will be developed including technical, economic, and achievable. Several scenarios will be included that take into account uncertainty in key inputs such as marginal costs, rates, and program funding levels.

3.3.3 2001 California Industrial Market Characterization and Potential Study

The study is an energy-efficiency market characterization of California's industrial sector. Using secondary source data from utility, government, academic, and non-governmental organization sources, the research identifies the primary energy-efficiency opportunities among industrial customers, both in terms of key industries (based on SIC code) and key technologies/end uses.

Utility program tracking data are analyzed to identify key program measures that have been promoted in prior years and to identify key industries and customer groups that have utilized the utility programs. Program evaluation data are reviewed to identify significant

barriers to the implementation of energy-efficiency measures. Current energy-efficiency programs efforts are compared to the findings of the market characterization.

Research also identifies particular market segments for future research, either among small, medium, and large industrial customers or for particular end-uses where significant energy-efficiency opportunities have been overlooked. Efforts focused on identifying industrial sector energy-efficiency opportunities amenable to both resource acquisition and to market transformation strategies.

3.3.4 Evaluation of Hawaiian Demand-Side Management Programs

Hawaiian Electric Companies and its two subsidiary utilities contracted XENERGY to design the impact and process evaluation plans for all of its DSM programs and to conduct all impact evaluations and various process evaluations for the program years from 1996 to 1999. The residential programs tended to focus on water heating measures such as solar water heaters. XENEREGY designed and implemented an end-use metering study that resulting in estimating of annual energy savings and peak demand impacts or various water heating measures. The commercial and industrial program provided incentives for efficient lighting, cooling equipment, motors, control systems, variable-speed drives, and building shell measures. XENERGY utilized site-specific studies involving on-site data collection, monitoring, and engineering analysis to determine the energy savings for the various technologies. More than 500 site studies were done over a 4-year period. XENERGY also designed various telephone surveys to assess free-ridership. XENERGY conducted process evaluations of the various programs that addressed issues such as ensuring consistent practices and increasing market penetration.

3.3.5 Public Service Company of Colorado Bid II DSM Program

XENERGY conducted pre-retrofit and post-retrofit peer reviews of proposed energy-efficiency projects for Public Service Company of Colorado's Bid II DSM Program. XENERGY reviewed contractor submittals for energy-efficiency work and approved

their energy-savings calculations. XENERGY then conducted on-site, pre-retrofit audits to confirm the baseline equipment and validate the contractors' savings claims. Following installation, XENERGY conducted post-retrofit verification audits to verify installation. Pre- and post-retrofit power monitoring was also conducted by XENERGY for selected sites.

3.3.6 Comprehensive Resource Analysis

XENERGY prepared a comprehensive analysis of energy-efficiency and renewable resources for use in planning and regulatory assessment of energy-efficiency programs in New Jersey. The analysis provided a clear and well-supported set of proposals regarding the expenditure of funds collected by the utilities through the Societal Benefits Charge. Specifically, the analysis:

- Identified the principal electric and gas energy-efficiency opportunities in New Jersey's residential, commercial, and industrial sectors:
- Identified the key opportunities to develop a specified set of renewable energy technologies;
- Provided a consistent framework for rating the appropriateness of potential measures and programs for SBC support;
- Characterized the principal efficiency and renewable opportunities along the following dimensions;
  - Total potential energy savings.
  - Cost-effectiveness of the measure or program, as measured by levelized cost of saved energy.
  - Current market penetration.
  - Assessment of the infrastructure available to support further development of the market.
  - The nature and severity of barriers to market transformation.
  - The nature and extent of complementary efforts by government agencies, regional organizations, and private sector market actors.
  - Consistency with the business goals of the sponsors.

3.3.7 US Industrial Motor Systems Market Assessment

XENERGY recently completed major multi-year study to characterize the market for efficient motor systems. The study, conducted for US DOE, is based on extensive analysis of existing data resources and primary on-site data collection of 265 industrial

facilities nationwide. The study resulted in a detailed profile of the inventory of motors in place in the national manufacturing sector, including numbers of motors and motor system energy disaggregated by industry, horsepower size, and application. The study included an estimate potential savings associated with common motor system efficiency improvement and a survey of motor system purchase, maintenance, and design practices to identify potential energy-efficiency program strategies.

3.3.8 Wastewater Plant Benchmarking Study

XENERGY was selected to study energy use in wastewater treatment plant aeration processes in the Pacific Gas and Electric service territory. In all, nine processes were benchmarked for energy use against daily average throughput and pounds of BOD destroyed. In addition, an oxygen utilization factor was calculated for each process. The benchmarks for these processes were then compared. The processes studied included surface aeration, coarse bubble diffusion, fine bubble diffusion, rotating biological contactors, and pure oxygen technologies. The results of the study will be presented to a roundtable of industry experts in November.

3.3.9 Commercial and Industrial Lighting Market Research Study

XENERGY completed a comprehensive market research study focused on the commercial and industrial (C&I) lighting industry of the Pacific Northwest (PNW). This study helped the Northwest Energy Efficiency Alliance develop initiatives tailored to the unique needs of the region's C&I lighting market. The overarching objectives for this research included: characterize the current market for C&I lighting products and services in the PNW, assess the merits of lighting technologies and practices that go beyond current standard practices, and provide suggestions for new Alliance initiatives in the C&I lighting market.

3.3.10 PG&E Industry Characterization Studies

These studies, each focusing on selected individual industries as defined by 2-digit SIC codes, have been conducted to support PG&E program planning efforts. In each study,

energy use has been profiled using data from PG&E's billing system. Key customers and competitive issues have also been addressed.

3.3.11 SDG&E/CBEE Market Effects Baseline Study

This study assessed roughly 100 market effects and impact evaluation studies, public and private databases, and other data sources with respect to how well they provide useful baseline data for future market effects studies.

3.3.12 PG&E Market Transformation Planning Project

This study involved various assessments of the Market Transformation Planning Project and associated opportunities. A number of "mini-studies" were conducted including: Evaporative Cooling Manufacturers Market Characterization & Barriers and Commercial Packaged HVAC Upstream Program Design Survey.

3.3.13 United States Compressed Air Systems Market Assessment

A follow-up to our successful motors study, this study provided an assessment of compressed air practices as related to the potential for energy-efficiency improvements. This work was conducted in support of the Compressed Air Challenge Program.

3.3.14 Residential Appliance Saturation Surveys

XENERGY has conducted Residential Appliance Saturation Studies for numerous clients located throughout the United States. Typical services include:

- Developing sampling plans;
- Conducting mail surveys;
- Conducting on-site data collection visits;
- Analysis of auditor collected data and customer reported mail survey data;
- Preparing a final report that summarized key variables of interest in a useable format.

RASS Clients include PG&E, San Diego Gas and Electric, Southern California Edison, Seattle City Light, PSI Energy, Public Service Electric and Gas Company, Oglethorpe

Power Corporation, Central and South West Services, Salt River Project, and Commonwealth Electric.

3.3.15 Statewide Commercial End Use Saturation Surveys (CEUS)

XENERGY is a subcontractor to RER on the current California CEUS project. This statewide project involves 2,500 on-site commercial surveys to identify commercial end-use equipment saturations, energy-use indexes, and load shapes. XENRGY will conduct 1,500 surveys in Northern California.

3.3.16 The Retail Energy Markets (REM) Studies

Currently in its 6th year, XENERGY's pioneering Retail Energy Markets (REM) Study has provided over 75 utilities, competitive suppliers and other industry stakeholders with a wealth of market information and intelligence, including analysis of over 13,000 surveys of customers in competitive markets, over 100 profiles of competitive energy companies and detailed analysis of regulatory and legislative provisions in major restructured states. In addition, XENERGY has conducted several topical studies related to competitive energy markets, including:

- Customer education campaigns
- New products & services
- Customer segmentation
- Internet strategies
- Green power markets
- Distributed generation
- Chains and national accounts
- Retail aggregation
- Retail gas markets
- Back room operations.

4 STAFF BIOGRAPHIES

Resumes for XENERGY team members are contained in Section 5. Following are brief biographies of key staff.

Michael W. Rufo, Vice President of Consulting, Western Region, is responsible for staff management and lead analytical work in the areas of industry restructuring, market transformation, new product and service assessment, customer research, and performance measurement and verification. Mr. Rufo has been active in all aspects of energy efficiency over the past 12 years and is known for high levels of client satisfaction and dedication to thorough, comprehensive, and defensible analyses.

He provides staff management and performs lead analytical work in industry restructuring, market transformation, market effects, new product and service assessment, customer research, and performance measurement and verification. Mr. Rufo is familiar with the full range of program strategies to promote market transformation, as well as with the methods available for assessing the effects of such programs.

Mr. Rufo has an M.A. in Engineering and Policy from Washington University, St. Louis, and a B.A. in Environmental Studies and Planning (Energy Management Program) from California State University, Sonoma. Mr. Rufo publishes and presents widely on a variety of energy issues.

Recent examples of his work include the following:

- **CBEE Nonresidential SPC Study**
- **PG&E Market Transformation Planning Study**
- **PG&E/SDG&E Commercial Lighting Market Effects Study**
- **CBEE Market Effects Baseline Study**

Richard S. Barnes is a Vice President at XENERGY and is responsible for operations in the Western Region of North America. Mr. Barnes combines his technical skills, project management experience, and industry knowledge to address a wide range of research, planning, and implementation challenges. Clients have relied on him to help understand

markets, seek out competitive advantages, implement business initiatives, and conduct assessments of performance.

Mr. Barnes' foundation is his considerable expertise and experience designing and implementing market research, program planning, and evaluation studies. He is an expert in numerous data collection techniques, sample design, experimental design, market segmentation, and multivariate analysis. He excels at communicating research findings that are critical in the planning and implementation process. He has managed several large, complex research, planning, and evaluation projects where his working knowledge of economics, engineering modeling, statistical analysis, and data collection have all been applied.

With 17 years of related experience in the energy industry, Mr. Barnes has worked for XENERGY since 1990. Mr. Barnes has a B.A. in Statistics from the University of California at Berkeley. Before joining XENERGY he worked at Pacific Gas & Electric Company for nine years.

Recent examples of Mr. Barnes' work include:

- **Evaluation of 1994 Industrial HVAC and 1994 Industrial Process Incentive Programs, PG&E**
- **1994-1998 Industrial Impact Evaluations, Portland General Electric**
- **Multi-Sector, Multiyear Impact Evaluation, Hawaiian Electric Company**
- **Understanding Utility Internet Strategies, Various Clients**

Dr. Miriam L. Goldberg, Vice President for Analytic Services, is one of the nation's leading experts in energy data development, modeling, and sample design, with more than twenty years of experience in the field. She has served as project manager or key technical adviser on dozens of major residential and commercial evaluations and data development projects, including RASS and end-use load shape development projects. Dr. Goldberg has worked extensively on the development of cost-effective approaches to data collection, including integration of methods for data collection and analysis that fully leverage multiple sources. Her work on sample design and data integration for end-use studies has included residential, commercial and industrial evaluations for Pacific Gas and Electric Company, Southern California Edison, Consumers Power Company,

Northern States Power Company, Boston Edison, ENTERGY, and an EPRI tailored collaborative.

Dr. Goldberg is also well established as a teacher of energy analysis methods, with recent efforts including workshops on evaluation and data development at:

- Chicago Evaluation Conference
- Affordable Comfort Conference
- ACEEE Summer Study
- Wisconsin Center for Demand-Side Research
- EPRI Comprehensive DSM Evaluation Workshop
- DA/DSM Conference, Workshop on Metering for DSM Programs

She is extremely effective at communicating key technical concepts to a general audience, both in writing and in person.

Before coming to XENERGY, she worked for six years at the U.S. Department of Energy, following three years of research and teaching at the University of Wisconsin. In her early work, Dr. Goldberg was one of the developers of PRISM, and conducted one of the first major evaluations to utilize this tool. She has a Ph.D. in Statistics and an M.S. in Mechanical and Aerospace Engineering from Princeton University, and a B.A. in Mathematics from Harvard University.

Recent work includes:

- **Industrial and Residential Retention Studies, PG&E**
- **Evaluation of Public Service Company of Colorado's Commercial Rebate Program and 50 MW Bidding Program**
- **Comprehensive evaluations of DSM programs for Iowa-Illinois Gas and Electric, for IES Utilities, and for MidAmerican Energy**
- **Evaluation of the Residential Energy Efficiency Programs, PG&E**

Mitchell Rosenberg, Director of Consulting (Eastern Region) has over 15 years of experience in market research and evaluation in the energy field. He has directed numerous market assessments and market effects studies in the area of industrial motors, drives, and compressed air technologies. He also has experience in the design and evaluation of training and technical assistance programs in the area of industrial

technologies. Mr. Rosenberg holds a BA in Economics from Columbia University and a Masters in City Planning from Harvard University.

He has directed or co-directed the following projects:

- **United States Industrial Electric Motor Market Opportunities Assessment, U. S. Department of Energy, Office of Industrial Technologies**
- **Northeast Premium Motor Initiative Market Baseline and Transformation Assessment, Northeast Energy Efficiency Partnerships and NYSERDA**
- **Evaluation of the Motor Challenge Program, U. S. Department of Energy, Office of Industrial Technologies**
- **Commercial Lighting Market Effects Study**, **PG&E/SDG&E**

Julie Blunden, Vice President, focuses on consulting related to renewable energy sources and customer energy choices in competitive and evolving energy markets. Her projects include strategic advice to a wide variety of clients, including renewable energy generating companies seeking customers in restructured energy markets, retail marketers working on federal and state policy, companies aiming to improve their green marketing performance, and the renewable generation and trading communities on market structure issues.

Ms. Blunden has extensive experience in strategic planning, finance, renewable retail and wholesale electric markets, and retail operations. She was a founding officer of Green Mountain Energy Company, the leading green power retailer in the United States. Through early 2001, Ms. Blunden was President of the Western Region for Green Mountain, with responsibility for profits and losses for a $50 million business.

From start-up to a mature, regional operating structure, Ms. Blunden led various parts of Green Mountain's business. Her responsibilities included reconstruction of the financial model, analyzing renewable power options for procurement, product strategy and design, and extensive analytical work and advocacy on market rules to support robust retail markets. During her tenure as Regional President, Ms. Blunden spent considerable time on retail/wholesale power procurement settlement issues, optimizing marketing channels and retention spending, ensuring compliance with CPUC and California Energy

Commission regulations for green power marketers, as well as brand evolution, operations and supervision of a sales force of up to 80 people in California.

While at Green Mountain, Ms. Blunden participated in the creation of Green-e, the certification standard for green power products in competitive retail markets http://www.green-e.org/ , she negotiated the first Low Impact Hydropower Certification Criteria with American Rivers, now used by the Low Impact Hydropower Institute http://www.lowimpacthydro.org/, and advocated for, instigated, and led the all-party Customer Data Transaction Working Group under the auspices of the California Public Utilities Commission http://ora.ca.gov/wk-group/dai/cdt/.

Before co-founding Green Mountain Energy, Ms. Blunden worked at the AES Corporation on independent power plant development and acquisitions. Her experience at AES includes extensive power plant siting and permitting, energy system modeling, financial model development and bank relationships, and fuel procurement.

Ms. Blunden sits on the Boards of the Center for Energy Efficiency and Renewable Technologies, the Institute for Solar Living, and the Center for Resource Solutions. Ms. Blunden received her M.B.A. from Stanford's Graduate School of Business. She graduated with an A.B. from Dartmouth College, majoring in engineering, modified with environmental studies.

Fred J. Coito is a Senior Consultant in XENERGY's Western Region office in Oakland, California. He serves as a project manager and lead analyst on utility research projects involving program impact evaluation, market assessment, program planning, and forecasting. Mr. Coito has more than sixteen years of energy and utility industry experience. He has had an integral role in numerous evaluation and planning projects for a number of major utility companies. Mr. Coito has written numerous papers and reports on energy-efficiency issues and has testified before the California Public Utilities Commission, the Federal Regulatory Commission and the California Energy Commission.

Before joining XENERGY, Mr. Coito worked for eight years at Pacific Gas and Electric Company as a Senior Energy Economist, where he was responsible for gas demand and electric energy forecasts used for regulatory filing and internal analyses. He received a B.A. in Business Economics and an M.A. in Economics from the University of California at Santa Barbara, and an M.B.A. from the University of California at Berkeley.

His experience includes:

- **Impact/Retention Evaluation of the 1997 and 1998 Industrial Energy Efficiency Incentive Programs, PG&E**
- **Evaluation of 1994 Industrial HVAC and 1994 Industrial Process Incentive Programs, PG&E**
- **Residential Retrofit Program Impact Evaluation, PG&E**
- **Residential New Construction Program Impact Evaluation, PG&E**
- **Commercial and Industrial Retrofit Impact Evaluations, Portland General Electric**
- **Residential Appliance Saturation Survey and Conditional Demand Analysis, PSE&G**
- **Low Income Program Impact Evaluation, SCE**

Kathleen McElroy, Senior Consultant, recently joined XENERGY in its Oakland office after having worked for 10 years as part of Hagler Bailly's utility market research and evaluation practice. She has contributed to numerous utility data collection efforts, many of which involved market transformation assessment. Ms. McElroy is particularly skilled in the design, administration, and conduct of both quantitative and qualitative analyses, incorporating data obtained via multiple sources (i.e., utility databases, trade databases, sales databases, interviews, and surveys). She is an excellent Project Manager, with a keen attention to detail and a successful track record in client satisfaction and budget/resource management.

Ms. McElroy has also worked on several international evaluation projects while with Hagler Bailly (now PA Consulting). Specifically, she managed a residential energy consumption survey conducted for the Ceylon Electricity Board (CEB). This two-year, data-intensive analytic effort requiring Ms. McElroy to make several trips to Sri Lanka to oversee data collection and manage local subcontractors. As a result of this study, Ms. McElroy developed a DSM Action Plan that was later adopted by the CEB and

implemented under the supervision of the World Bank. In addition, Ms. McElroy worked on several research projects involving energy efficiency program evaluation involving countries such as Jamaica, Thailand and the People's Republic of China.

Ms. McElroy holds an M.S. in Energy Management and Policy and Appropriate Technology from the University of Pennsylvania and a B.A. in Economics and International Relations from The American University.

Her recent, related work includes:

- **CBEE Baseline Study of Public Awareness and Attitudes Toward Energy Efficiency**
- **PG&E/SDG&E Market Effects Study for Refrigerators and CFLs**
- **PG&E Residential EMS Market Effects Studies**
- **Process Evaluation of PG&E's Residential Energy Efficiency Programs**
- **Evaluation of Pilot HESL Program, PG&E**

Steven J. Giampaoli, P.E., has more than 22 years of industrial experience in the design, construction, and maintenance of industrial facilities. Mr. Giampaoli has extensive experience in the design, installation, troubleshooting and maintenance of machinery, heat transfer equipment, cogeneration plants, and electrical substations in oil refineries, terminals, and pipeline systems.

As the Project Manager for UNOCAL's Reformulated Fuels project at its Wilmington, CA Refinery, he was responsible for conceptual process design, environmental permitting, process and mechanical design review and approval, coordination of construction activities, acceptance of completed facilities, commissioning of facilities, training of operators and maintenance staff startup and performance testing of facilities.

Since leaving UNOCAL in 1997, he has worked with a multitude of commercial and industrial clients on energy efficiency improvement projects. In addition to performing a number of facility-specific site survey and feasibility studies for industrial customers, recent utility projects include:

- **Impact Evaluation of PG&E's 1997 and 1998 Industrial Programs**
- **Impact Evaluation of SDG&E's 1997 Industrial Program**
- **Impact Evaluation of Portland General Electric's 1997 and 1998 Industrial Programs**
- **Impact Evaluation of Commercial HVAC Projects- Hawaiian Electric Company**

Mr. Giampaoli has a B.S. in Mechanical Engineering from the University of California at Davis and holds a P. E. in the field of Mechanical Engineering in the state of California.

Richard S. Ridge, Ph.D., Senior Consultant, has worked on numerous utility projects involving a variety of analyses, including forecasting, choice modeling, program evaluation, and program planning. Before joining XENERGY, Dr. Ridge was involved in energy industry activities for over 17 years. Dr. Ridge is noted for his ability to work as an adjunct to utility in-house staff to meet a wide range of project needs, which he has done successfully for Southern California Edison over the past several years. He has worked on a number of recent projects for PG&E, SCE, SDG&E, and the California Board for Energy Efficiency.

Dr. Ridge has a Ph.D. in Public Administration from the University of Southern California.

Recent work includes:

- **PG&E's Evaluation of the Food Services Technology Center**
- **SCE's Residential Market Share Tracking System**
- **CBEE/SCE Evaluation of Nonresidential Standard Performance Contract Program**
- **Customer Choice Modeling for Cellular Telephones, Motorola, Inc**.
- **Evaluation of the Anti-Smoking Program, Los Angeles Chapter of the American Lung Association**
- **PG&E's Evaluation of the 1995 and 1996 Industrial Programs**

Leslie D. Owashi, Senior Manager in XENERGY's San Diego Office, is responsible for DSM program analyses, planning and implementation, market research and data and systems management. Mr. Owashi has over 17 years of energy and utility experience. He brings an abundance of experience managing data collection projects, including

survey implementation and monitoring applications, as well as research and analysis planning and consulting. He has managed program evaluation and data collection projects requiring a variety of data gathering techniques and provided research and analysis planning and consulting.

Before joining XENERGY, Mr. Owashi worked as a Marketing Information Supervisor for SDG&E where he performed qualitative and quantitative marketing information in the commercial/industrial and residential sectors. He also supervised the Research and Analysis section of Gas Marketing, planned and performed benefit-cost and system load studies, and analyzed results of experimental load management projects. Mr. Owashi has a Masters in Business Administration from San Diego State University and a B.A. in Biology from the University of California, San Diego.

Recent projects include:

- **Impact Evaluation of SDG&E's 1997 Industrial Program**
- **Retention Study of SDG&E's 1994 and 1995 Industrial Programs**
- **Impact Evaluation of the 1997 Industrial Energy Efficiency Incentive Programs, PG&E**
- **Strategic Energy Plan for the Electric Restructuring Committee, City of Santa Ana**

Karin A. Corfee, Senior Consultant, provides qualitative and quantitative research on market evaluation and retail energy consulting projects. Responsibilities include analysis of emerging retail markets, regulatory analysis, energy efficiency program planning and market evaluation, market research, strategic planning, economic analysis and new product development. Ms. Corfee has a B.S. in Energy Resources from the University of California, Berkeley and an M.S. in Civil Engineering from Stanford Univeristy.

Recent projects include:

- **Northwest Energy Efficiency Alliance Duct Efficiency Pilot Program Evaluation, Northwest Energy Efficiency Alliance**
- **Retail Wheeling Study, Confidential Clients**
- **California Baseline Data Study, California Board for Energy Efficiency and San Diego Gas and Electric Company**
- **Industrial Energy Efficiency Incentive Program Impact Evaluation, PG&E**
- **Evaluation of Pacific Power's Direct Access and Portfolio Pilot Programs, Pacific Power**
- **Measurement and Evaluation of Hawaiian Electric Company's DSM Programs, Hawaiian Electric Company**

Dr. Valy T. Goepfrich, Economic Analyst, has worked on a variety of evaluation and market research projects over the past few years. Her focus is on quantitative analysis of load research, billing, and survey data. Dr. Goepfrich has a Ph.D. and M.S. in Economics from the University of Wisconsin-Madison, and a B.A. in Economics from Fairfield University (Fairfield, CT). Her minor at the University of Wisconsin-Madison included Econometrics and Mathematical Economics, and her Ph.D. dissertation, which analyzed the location choices of United States biotechnology firms, involved extensive econometric analysis.

Recent projects include:

- **Evaluation of the Residential Multifamily EMS Program, PG&E**
- **Residential Appliance Saturation Survey, PSE&G**
- **Residential Appliance Saturation Survey, Oglethorpe Power Corporation**
- **Analysis of Alternate Load Profiling Methods, EPRI and Various Utility Clients**

Frank Powell, P.E., has more than 20 years of experience conducting facility energy evaluations involving complex engineering analysis, DOE-2 modeling, and overseeing data collection efforts. Mr. Powell is especially skilled at communication with facility engineers and with efficient site data collection while minimizing disturbance of customers. Before joining XENERGY, Mr. Powell was the Director of Engineering with the National Energy Management Institute.

Mr. Powell has an M.S. in Civil and Environmental Engineering from Cornell University, and a B.S. in Mechanical Engineering from Cornell University.

His experience includes:

- **Evaluation of 1994, 1997, and 1998 Industrial Incentive Programs, PG&E**
- **1996 and 1997 Industrial Process, Motors, and Agricultural Pumping Program Evaluations - SDG&E**
- **1994-1998, Industrial and Commercial Impact Evaluation, Portland General Electric Company**

Tom S. Michelman, Senior Consultant, has worked on numerous evaluations and market research studies involving a variety of analyses. He has specialized in survey design, implementation, and analysis, choice modeling, and regression analysis. Mr. Michelman has over five years experience in the energy industry and ten in quantitative analysis. He has a B.A. in Mathematical Methods for the Social Sciences from Northwestern University and an M.S. in Resource Economics from the University of Rhode Island.

His work includes:

- **Residential Lighting Spillover Study, Consortium of Five New England Electric Utilities**
- **Residential Retrofit Program Impact Analysis, PG&E**
- **Retail Wheeling Multi-Client Study**
- **Master Thesis. Contingent Valuation and the Bounded Rationality Perspective**

Geoffrey G. Syphers, Energy Engineer, is responsible for managing building energy computer simulation analysis at XENERGY. His work in this area includes a long list of building types and energy efficiency measures, covering residential, industrial, government facilities, retail, commercial high-rise, schools, prisons, and includes measures from chiller replacements to lighting retrofits and EMS installations. Mr. Syphers has performed numerous efficiency evaluation studies and energy-efficient lighting retrofit designs. He has special expertise in the area of new building energy performance contracting, having developed a set of standard contracts for this purpose as part of a larger guide he wrote on the subject.

Prior to joining XENERGY, Mr. Syphers worked for Eley Associates, performing building energy analysis computer simulations in DOE2, life-cycle cost studies, technical support and research on energy-related topics. Mr. Syphers holds an M.S. in Energy Engineering from the University of Massachusetts and a B.S. in Physics from Sonoma State University. He is a member of the Association of Energy Engineers.

His experience includes:

- **Evaluation of 1997 and 1998 Industrial Programs, PG&E**
- **Evaluation of the 1996 and 1998 Residential New Construction Program - PG&E**
- **Lighting Survey and Redesign, University of California at Davis**
- **ACT^2, PG&E**
- **Business Energy Survey Tool, PG&E**
- **Nonresidential Standard Performance Contracting Program, SCE**

Erik S. Dyrr, Project Engineer**,** has been responsible for managing and performing energy audits, surveys, and engineering studies. He has provided technical expertise for metering and monitoring activities including equipment specification and protocols. Mr. Dyrr has a B.S. in Industrial Technology from California Polytechnic State University.

His recent work includes:

- **Evaluation of 1994, 1997, and 1998 Industrial Incentive Programs, PG&E**
- **Commercial End Use and Whole Building Load Research Project - Portland General Electric**
- **Impact Evaluation - Hawaiian Electric Company**
- **Impact Evaluations of the Commercial / Industrial Retrofit Programs - Portland General Electric**

Tami M. Rasmussen, Energy Analyst and Quality Control Specialist, has performed a variety of quantitative and qualitative research in support of energy-efficiency consulting projects. She performs general data analyses for a variety of projects, marketing and cluster analyses, quality control for on-site audits, statistical testing for market research, and process evaluations for utility programs. Other duties include performing quality control on billing disaggregation for residential utility customers, improving production process efficiency by creating VAX programs to increase automation, generating

residential appliance saturation tables, and deriving end-use energy consumption estimates.

Ms. Foster holds a B.A. in Economics, with concentration in Natural Resource Economics, from the University of California at Santa Cruz and a M.A. in Economics, with concentration in Econometrics, from the University of California at Santa Barbara.

Her experience includes:

- **Residential New Construction Program Impact Evaluation, PG&E**
- **The Recap Residential Bill Disaggregation Project, PG&E, SDG&E, SCE**
- **Residential Appliance Saturation Survey, PSE&G**
- **Statewide NSPC Evaluation, CBEE/SCE**
- **Impact Evaluation - Hawaiian Electric Company. Ms. Foster assisted in survey QC and lighting analysis activities.**

Julia K. Larkin performs a variety of quantitative and qualitative research in the areas of energy policy, energy-efficiency, market assessment and market transformation. Working with community and municipal organizations, Ms. Larkin has also completed considerable research in the areas of sustainable development and community-based initiatives. She brings to our team a deep understanding of community-based organizations, energy and environmental conservation practices, and energy policy considerations related to sustainability and community-based initiatives. Ms. Larkin has a B.A. in Modern Society & Social Thought from the University of California at Santa Cruz and a Masters in Public Policy from the Goldman School of Public Policy at the University of California at Berkeley.

Recent experience includes:

- **Statewide NSPC Evaluation, CBEE/SCE**
- **Understanding Utility Internet Strategies, Various Clients**
- **CBEE Market Effects Baseline Study**

5 RESUMES

RICHARD S. BARNES

EXPERIENCE HIGHLIGHTS

XENERGY Inc., Oakland, California, 2001-Present
Senior Vice President, Demand Side Services. Responsible for all demand-side implementation services offered by XENERGY. Also serves as officer-in-charge for projects in the Western Region of North America. Areas of focus include energy efficiency program implementation, demand responsive programs, customer care and education, engineering and field services, program design, Internet strategies, market assessment, and program evaluation.

XENERGY Inc., Oakland, California, 1996-2000
Vice President, Western Region. Served as Director of Operations for all XENERGY projects in the Western Region of North America. Key responsibilities included: utility consulting, market research, program evaluation, program implementation, and information technology products and services. Also served as XENERGY's Vice President of Marketing for its Energy Services offerings in 1997.

XENERGY Inc., Oakland, California, 1990-1995
Director, Research and Consulting. Designed and managed projects for utility clients. Provided consulting on positioning of products and services. Research projects included market assessment, performance measurement (evaluation), load research, market research, data collection, forecasting, and technology assessment. Provided consultation on marketing strategy, tactical approach, business planning, and product/service positioning. Manager of business unit resources, providing strategic direction and guidance on all projects. Responsible for ensuring high-quality performance on research projects while meeting the needs of clients.

Pacific Gas and Electric, San Francisco, California, 1988-1990
Market Research Supervisor. Supervised six to 12 professional employees and consultants. Lead responsibility for all market research projects. Projects included market segment analysis, technology potential, customer needs and satisfaction, energy use study, program evaluation, and positioning studies.

Pacific Gas and Electric, San Francisco, California, 1986-1988
Senior Market Analyst. Conducted market segmentation and developed strategies for key market segments. Managed primary and secondary market research projects, including appliance saturation surveys, industry and consumer decision making, and technology assessment.

Pacific Gas and Electric, San Francisco, California, 1981-1986
Energy Economist. Performed customer analysis on energy demand and equipment holdings using conditional demand and discrete choice analysis. Conducted program impact evaluations by analyzing customer billing information. Developed and enhanced end-use forecasting models used to quantify the impacts of demand-side management programs.

EDUCATION

University of California at Berkeley, B.A. in Statistics, Math emphasis, 1983

FIELDS OF SPECIAL COMPETENCE

- Business Management
- Business Development
- Performance Measurement
- Market Research / Statistical Analysis
- Customer Relationship Management
- Demand Side Management Services

PROJECT EXPERIENCE

Manager of more than 100 consulting, research, planning, and program implementation projects for more than 50 utilities and energy agencies throughout North America and Europe. These projects have covered as wide range of energy issues and required a combination of research, engineering, and management skills. Selected project areas are described below.

Program Design & Management. Managed numerous turnkey projects directed at providing customer-specific energy information and marketing. Designed and managed an innovated peak load reduction program targeted at business and industrial customers. Managed and designed three commercial direct-install programs targeting lighting and HVAC improvements. Designed and implemented a Demand-responsive marketing program. Designed a five-year demand-side management plan involving six programs directed at various market sectors.

Energy Industry Internet Strategy Studies. Conducted an assessment of Internet web sites and business strategies being pursued by both regulated and non-regulated energy companies. Developed taxonomy for assessing general strategy and market position. Assess the current state of content and marketing activities. Surveyed potential user of energy company websites to assess behavior and preferences. Developed a general Internet strategy recommendation for various types and energy companies.

Energy-Related Decision Making Studies. Collected and analyze data from several competitive energy markets to assess the decision factors used by energy consumers when selecting an energy supplier. Studied consumers from all market segments. Performed segmentation analysis to support development of target marketing strategies.

Internet Application Development. Managed a business area responsible for developing on-line energy analysis tools and other customer relationship management applications. Had lead responsibility for functional design of applications and business development. Activities led to installation of applications for several energy companies.

Program Evaluation. Designed and managed numerous evaluations of both residential and nonresidential DSM programs. Specialized in evaluation designs that integrate several methods, including engineering analysis, on-site data collection, short-term metering, analysis of load research data, regression analysis of billing data, customer surveys, staff interviews, and discrete choice models of customers' purchase decisions. Experience with both retrofit and new construction programs.

Market Research on Services and Programs. Conducted several research projects on customers' reactions and needs for utility services, including energy services, rate options, bill

payment options, customer inquiries, green services, and billing information. Develop market strategies for improving satisfaction with existing services and developing new service options. Conducted process evaluations on service delivery and DSM programs to explore such issues as participation, satisfaction, brand loyalty, and willingness to pay.

Energy Use Surveys. Managed several projects to collect information on appliance holdings, end-use energy use, customer characteristics, and potential for products and services. Responsibilities involved project design, sampling strategy, questionnaire design, on-site data collection, data validation, survey analysis, and energy end-use analysis.

Load Research. Managed several projects to develop estimates of end-use and class load profiles.
Developed methods to integrate metering data with statistical analysis of survey data to produce load shapes estimates in a cost-effective manner. Developed methods to examine profitability of customer segments using load research results.

Competitive Positioning Studies. Conducted customer research to understand the competitive strength and weaknesses of utilities with regard to the products and services they offer. Examined customer preferences for private versus public utilities. Explored issues regarding perceptions of price, quality, and other value attributes. Development of branding strategies to emphasize competitive advantage.
Capital Investment Decision Study. Completed studies on commercial customers to gain an understanding of the decision process and buying factors used when making HVAC replacement or cogeneration purchase decisions. The results of this study effectively influenced the decision process by emphasizing the factors and key players involved in different market segments.

Technology Assessment. Analyzed competing technologies both from customer preference and financial perspectives. Studies have involved both cross-fuel technologies and cross-efficiency technologies. Special focus has been on expanding the assessment to explore such issues as perceptions of reliability, risk, timing, product quality, and environmental factors.

DSM Assessment and Planning. Managed projects that included market assessment of DSM potential, development of short- and long-term DSM strategies for utility companies that have limited DSM experience. Developed the DSM assessments for integrated resource planning. Provided regulatory testimony on DSM assessment.

Conditional Demand Analysis. Managed conditional demand studies to estimate the energy used by major gas and electric end users. Projects used both monthly and hourly data.

Energy Forecasts. Managed projects that produced long-term forecasts for the residential and commercial sector using end-use modeling and econometric modeling. Developed technology options by end-use and technology choices modeling. Produced written documentation for regulatory filings.

HVAC Industry Market Transformation Design. Design and managed a MT program to change the practices of HVAC contractors. The program involves aspects of training and marketing support. It seeks to transform the market position of contractors from a low price orientation to being perceived as energy efficiency expert that strives to build a long-term ongoing relationship with customers through commissioning services and information dissemination.

Generation Market Analysis. Completed a study to determine a price at which customers find it cost-effective to generate their own electricity. This study required the development of an indifferent price matrix for various types, sizes, and generating equipment used at various load factors. Used individual customers' energy-use characteristics to estimate the various generation strategies a customer would use to minimize his or her electricity costs. From this analysis, the distribution of indifference rates was estimated for various segments of customers.

Home Builder Study. Conducted a survey of residential home-builders to determine major factors that influence their decisions on what equipment they install. This study focused on fuel choice, energy-efficient equipment, and shell conservation measures.

MICHAEL W. RUFO

EDUCATION

Washington University, M.A. in Technology and Human Affairs, 1986
California State University, Sonoma, B.A. (Full Honors) in Environmental Studies and Planning (Energy Management Design Emphasis), 1985
Uppsala University, Sweden, One-year intensive program in International Development, 1982-1983

EXPERIENCE HIGHLIGHTS

XENERGY Inc., Oakland, California, 1987-Present
Vice President, Consulting Services, Western Region. Providing project management, marketing, and supervision for staff of 15 in the areas of market assessment, energy-efficiency resource assessment, retail wheeling, new product and service analysis, market transformation, and program evaluation.

Washington University, Department of Engineering and Policy, St. Louis, Missouri, 1986
Research Assistant. Developed and compared statistical methods used to estimate energy savings attributable to residential conservation measures and programs. Analyzed aggregate-level natural gas consumption trends using alternative regression models.

California State University, Sonoma, Campus Planning, Sonoma, California, 1984-1985
Energy Analyst. Analyzed building energy end-use patterns, performed economic evaluation of conservation projects, explained campus conservation program to faculty and staff, and wrote grant proposals to the CSU Trustees.

FIELDS OF SPECIAL COMPETENCE

- Market and Technology Planning and Assessment
- Energy Efficiency Resource Assessment and Program Design
- Electric Industry Restructuring and Regulatory Policy Analysis
- New Product and Service Analysis

MAJOR PROJECTS: MARKET PLANNING AND ASSESSMENT

Commercial Energy-Efficiency Potential Study – PG&E/SCE/SDG&E. Currently managing a comprehensive bottom-up assessment of the technical, economic, and market potential for energy efficiency in the commercial sector in California.

DEER 2001 Update Study (Measure Costs and Savings). Principal-in-charge and designer of project that developed detailed databases of energy-efficiency measure costs. The methods employed to develop the data included interviews and surveys of wholesalers and contractors, analysis of utility cost data available in program tracking databases and hard-copy invoices, and development of innovative cost models to explain observed price variations. Also managed developed of per unit residential energy and peak demand impacts.

Evaluation of California's Nonresidential Standard Performance Contracting Programs/Baseline Assessment of Large Nonresidential Markets. Managed comprehensive

evaluation studies of California's NSPC programs for 1998, 1999, 2000, and 2001. These studies included the application of a theory-based evaluation approach, development of market effects indicators, assessment of baseline demand for energy efficient services such as performance contracting, assessment of market effects achieved, development of process evaluation results, and recommendations for improving program performance.

Market Assessment and Evaluation Studies for California's Small/Medium Nonresidential Markets. Managed sequential, comprehensive studies of small/medium nonresidential market structures and baseline conditions and evaluated program interventions for program years 1999, 2000, and 2001. Conducted studies measuring end user attitudes, actions, and awareness (cross-sectional and longitudinal); evaluations of the Small Business Standard Performance Contracting and Express Rebate programs; tracking analyses of program accomplishments; and an assessment of remaining energy efficiency potential.

Assessment of California's Baseline Information Sources. Managed a compilation and assessment of over 100 potential sources of baseline information on California's energy efficiency markets. Gaps in information available were identified and recommendations for baseline research provided.

PG&E Market Transformation Planning Study. Managed a comprehensive study that included analysis of over 60 potential new program initiatives; development of critical market transformation indicators; and a series of targeted market research efforts that documented past market effects and supported several new market transformation initiatives.

PG&E/SDG&E Commercial Lighting Market Effects Study. Managed bellwether study involving measurement of market effects of sponsors lighting programs during the 1992 to 1996 period. Includes over 150 supply-side actor interviews and 900 customer surveys. Study is a critical part of the CPUC's call for more in-depth analysis of the market effects of past programs.

Commercial End-Use Load Shape Development, Portland General Electric. Managed a comprehensive study that developed end-use load shapes for six key customer segments. The study included calibration of DOE-2 models to sub-metered data for 22 sites and to whole-premise, hourly data for several hundred other sites for which on-site surveys were conducted.

1994 and 1996 Measure Cost Studies, California Demand-Side Management Advisory Committee (CADMAC). Managed and provided lead analysis for projects that developed highly-detailed databases of DSM technology and measure costs for CADMAC. The methods employed to develop the data included interviews and surveys of wholesalers and contractors, analysis of utility cost data available in program tracking databases and hard-copy invoices, and development of innovative cost models to explain observed price variations. The final products are Databases of Recommended Values that provide the best cost estimate for each measure to be used for planning, implementation, and evaluation analyses conducted by California utilities and regulatory agencies.

IRP Support, Portland General Electric. Managed the development of a forecast of DSM program potential for inclusion in PGE's 1994 IRP process. Analyzed a variety of data sources from the Pacific Northwest including ELCAP commercial load shape data and the PNONRES commercial on-site survey data. Developed estimates of technical, economic, and program potential using penetration models calibrated to PGE's actual program results.

DSM Policy Support for Spain, Grupo ENDESA. Provided analytical support to Grupo ENDESA in the development of a regulatory policy proposal to the Ministry of Energy for implementing DSM in Spain. Reviewed and supplemented issues related to payment terms, lost revenue adjustments, role of evaluation, and elements to be included in the proposals of utilities submitting program plans.

DSM Potential Assessment in Spain, Grupo ENDESA. Managed a major DSM assessment for a group of Spanish utilities (Grupo ENDESA). Project included sample design, survey development, and data collection in three major sectors; development and implementation of end-use analysis models; evaluation and incorporation of Spanish-specific technology assessment; and final data integration using DSM ASSYST to estimate technical, economic, program, and naturally-occurring energy-efficiency potentials.

Long-Term DSM Uncertainty Analysis. Developed a probability-based analysis of the uncertainty in forecasted DSM program savings using a two-stage process. In the first step, uncertainty distributions were created for individual programs to program forecasts based on hypothesized variances in key input parameters. The resulting program-specific cumulative probability distributions were then input into a second-stage analysis that estimated the combined effect of uncertainty across programs, assuming different levels of partial correlation between errors.

DSM Technical and Economic Potential, Southern California Edison. Managed and provided lead analysis for comprehensive, bottom-up assessment of the technical and economic potential for energy-efficiency improvements. Conducted analyses for more than 3,500 technology/market segment combinations using the DSM ASSYST program, including integration with existing base case forecasts. Cumulative effects were estimated over a twenty-year forecasting period using automated supply curve analyses. Results served as input to Edison's long-term DSM program forecasts and integrated resource plan.

1992 Technology Cost Database, California Conservation Inventory Group (CCIG). Managed and provided lead analysis for a project that developed a highly-detailed database of DSM technology costs. The project developed cost estimates for 150 measures that were disaggregated into 873 unique technologies to create the specificity needed for "apples-to-apples" comparisons. Several technology cost models were developed to help explain the wide price variations observed in real markets. CCIG members are currently using the database in a variety of planning, evaluation, and implementation activities.

DSM Technology Characteristics and Load Shapes, San Diego Gas & Electric Company. Managed and provided lead analyses for a detailed study of DSM technology costs (including ten-year price forecasts) and load shape impacts. Developed incremental DSM impacts in thirty-six-day load shape format by integrating per-unit market segment savings with sector level end-use load shapes in SAS. These data served as the demand-side inputs to SDG&E's 1991 integrated resource planning process.

DSM Technical and Economic Potential, Pacific Gas & Electric Company. Co-developed a detailed analysis framework (DSM ASSYST) and supporting data for estimation of the technical and economic potential of DSM technologies in the Pacific Gas & Electric Company's residential and commercial sectors. Provided analytic support on the characterization of DSM technologies in PG&E's integrated resource planning process. (Original work 1989; updated 1991.)

DSM Technical and Economic Potential, Sacramento Municipal Utility District (SMUD). Managed and provided lead analytic support for a comprehensive DSM potential study for the Sacramento Municipal Utility District (SMUD). Developed spreadsheet versions of the California Energy Commission's Peak Forecasting Model to obtain calibrated estimates of peak demand by market segment and end use.

Residential Program Design, Ontario Hydro. Assisted in the development of a research and planning framework for second generation residential programs at Ontario Hydro. Developed estimates of the technical potential of residential DSM technologies and contributed to the delineation of a research agenda aimed at reducing uncertainties in program impacts and implementation.

Least-Cost Planning, State of Rhode Island. Assessed the energy, demand, and economic impacts; barriers to implementation; and expected future improvements of a number of conservation technologies in support of a least-cost planning analysis for the Governor's Energy Office.

DSM Regulatory Filing, San Diego Gas & Electric Company. Assisted San Diego Gas & Electric Company in meeting the California Energy Commission's ER '90 filing requirements regarding integration of forecasted DSM programs with technical and cost-effective potential estimates and results from integrated resource planning analyses.

Commercial Market Assessment, Confidential Client. Designed an in-depth questionnaire, identified key customer contacts, and conducted detailed customer interviews to develop energy use and market assessments for twenty of client's largest commercial customers. The assessments provided five-year forecasts of likely changes in customer's electricity purchases as well as analysis of the customer's business focus, competitive position, energy-related decision-making process, and technological characteristics.

Cogeneration Program Assessment, Massachusetts Executive Office of Energy Resources. Conducted in-depth telephone interviews with state officials responsible for programs that promote cogeneration development in state facilities. Evaluated and compared the successes and failures of cogeneration financing and risk allocation mechanisms, as well as RFP procedures and criteria in California, Florida, and New Jersey.

Appliance Efficiency Forecast, Commonwealth Electric Company. Reviewed estimates of the impact of appliance efficiency standards on the potential for additional appliance efficiency improvements through the year 2000.

RECAP™, XENERGY Inc. Developed SCE-specific default and setup data for XENERGY's Residential Energy Consumption Analysis Program (RECAP™), including extensive review of UECs from the CEC, SCE, and several other sources of most major residential end uses. Developed factors to adjust space conditioning and appliance consumption estimates and to account for savings attributable to California's building and appliance efficiency standards.

MAJOR PROJECTS: UTILITY RESTRUCTURING AND NEW PRODUCTS AND SERVICES

Study of Retail Wheeling Pilots, Confidential Clients. Led *Infrastructure Issues* Tasks, of multi-phase retail wheeling multi-client study. Analyzed revenue cycle service unbundling trends, billing options, metering protocols, and load profiling methods implemented in pilots and emerging restructured markets.

California Commercial Customer Baseline/Choice Study. Confidential Clients. Conceived and led a multi-client study of competitive supplier decision-making consisting of 600 small and medium commercial customers in California. This study measured awareness, willingness-to-switch, distribution of price discounts required for switching, and quantified the importance of non-price factors on customers choice of providers.

International Supplier Choice Modeling. Confidential Client. Currently managing a choice modeling study of customers in several international markets. This study will provide estimates of switching price discounts and the importance of non-price factors on customers' choice of suppliers.

CA Direct Access Business Issues Assessment. Confidential Client. Developed an assessment of the key direct access infrastructure issues in California, including a strategic analysis of their effect on doing business in this market. Key aspects of the study included analysis of utility distribution company (UDC) and alternative stakeholders' Direct Access tariff filings, with particular focus on metering and billing responsibilities and unbundled charges/credits; analysis of scheduling coordinator requirements and expected costs; wholesale/retail pricing assessment; and assessment of publicly available versus privately held customer data.

Strategic Assessment of Residential Energy Information Services, Confidential Client. For a major telecommunications provider, analyzed the features and relative costs and benefits of several residential energy information services (EIS). Specific information systems compared included automated meter reading (AMR), AMR with time-of-use rates, AMR with real-time pricing and direct load control, and full-service home automation systems linked by two-way communication with the utility. Estimated savings to utilities in terms of reduced operation costs for manual meter reading, remote connects/disconnects, theft, and reduced marginal costs of capacity resulting from load shifting enabled by the energy information systems. Strategic recommendations were developed for providing electric utilities and their customers with competitive energy information services.

Residential Energy Information Service Development, Confidential Clients. Developed market analysis section of a comprehensive business plan that assessed a new energy service that is targeted at providing high value information at a low cost to residential customers. Developed and managed focus groups to gauge customers' opinions on existing and potential information-based services, analyzed willingness-to-pay and market potential, and assessed strengths and weaknesses of potential competitors.

MAJOR PROJECTS: PERFORMANCE MEASUREMENT

Nonresidential Measure Retention Study, Pacific Gas & Electric Company. Provided analytical support in developing measure retention rates from on-site survey data and program tracking records. Developed a regression model in which changes in retention rates were related to market segments, program types, and technologies.

Residential Program Evaluation Planning, Pacific Gas & Electric Company. Co-developed three-year residential program evaluation plans with Pacific Gas & Electric Company for programs that qualify for shareholder incentives as part of the 1990 Collaborative Process.

Forecasted C&I Program Impacts, California Energy Commission (CEC). Evaluated conservation and load impacts estimated by California utilities for their commercial and industrial programs and reported to the CEC. Differences in utility savings estimates attributable to key evaluation parameters (e.g., net-to-gross ratios) were analyzed and recommendations were made to the CEC to improve program characterization in the demand forecast.

Title 24 Monitoring Project. Conducted statistical billing data analysis, using the Princeton Scorekeeping Method (PRISM), of the heating and cooling consumption of a sample of new homes in California, which must meet the State of California's Title 24 energy performance standards. Provided analytic support in explaining differences in energy consumption for new homes as estimated by PRISM, conditional demand analysis, and building simulation.

Residential TOU Screening, Pacific Gas & Electric Company. Managed a pilot project that evaluated the effect of using XENERGY's Residential End-Use Consumption Analysis Program (RECAP), which performs individual customer bill disaggregation and rate analyses, to screen customers most likely to benefit under a voluntary time-of-use rate offered by the Pacific Gas & Electric Company.

Persistence of Conservation, Bonneville Power Administration (BPA). Conducted a telephone survey of engineers and energy service providers to investigate the expected lifetimes of numerous conservation activities and technologies. Conducted analysis of both telephone and mail survey responses and wrote the final report for the project.

Commercial Program Process Evaluation, Bonneville Power Administration (BPA). Conducted a telephone survey of engineering and audit firms to gather data for an evaluation of BPA's commercial audit program (CAP). The survey focused on the process by which the audits were conducted and solicited information regarding recommendations for program modifications.

PUBLICATIONS AND PRESENTATIONS

"Applying a Theory-Based Approach to California's Nonresidential Standard Performance Contract Program: Lessons Learned." with Seymour Goldstone and John Wilson. Presented at the ACEEE 2000 Summer Study on Energy Efficiency in Buildings. Washington, D.C. August 2000.

"Market Assessment and Evaluation of California's 1999 Small and Medium Nonresidential Energy Efficiency Programs." Presented at the ACEEE 2000 Summer Study on Energy Efficiency in Buildings. Washington, D.C. August 2000.

"Evaluation of the 1998 California Non-Residential Standard Performance Contracting Program: A Theory-Driven Approach." Presented at the 1999 International Energy Evaluation Conference. Denver, CO. 1999a.

"A Comprehensive Assessment Of The California And National Markets For Non-Residential Energy-Efficiency Services." Presented at the 11th National Energy Services Conference. Boca Raton, FL. 1999b.

Using Choice Modeling to Understand Customer Preferences, Chapter 4 of *Customer Choice: Finding Value in Retail Electricity Markets*, A. Faruqui and J.R. Malko, Editors, Public Utility Reports Inc., March 1999.

"The Opening of the California Market: Making Sense of the Start," Infocast Conference on the Energy Revolution in California Conference, San Francisco, California, June, 1998.

"Revenue Cycle Unbundling: National and California Perspectives," Competitive Billing Strategies Conference, IBC Conference, San Francisco, California, December, 1997.

"Analyzing the Customer Market for Green Power," with Glenn Reed, Marketing Green Power and Preparing for State and Federal Regulatory Initiatives, IBC Conference, Washington D.C., November, 1997.

"Determining the Incremental Value of Residential Energy Information Systems: A Clear Approach to an Uncertain Future," *Utilities Policy*, Vol. 6, No. 2, pp. 137-149, 1997.

"Inside the Looking Glass: Observations and Lessons Learned from Retail Wheeling Pilots," Plenary Session, Building Skills and Strategies for Individuals and Organizations, Association of Energy Service Professionals Annual Meeting, Beverly Hills, CA. December 2, 1996.

"Energy Information Services and DSM: Merging Lanes on the Information Superhighway," presented at the American Council for an Energy-Efficient Economy 1996 Summer Study, Panel 7--Energy Efficiency and the Utility of the Future, Asilomar, California, August 25-31, 1996.

Market Segmentation, Energy Retailing and Small Customers, workshop on Marketing Strategies in a Deregulated World: How to Win, Orlando, Florida, April 16, 1996.

"Energy Information Services: Utility Restructuring Provides Fertile Ground for Growth," *Energy Magazine*, April, 1996.

Assessment of Residential Energy Information Systems, report for confidential client, July 1995.

"Results from PG&E's Nonresidential Measure Retention Study," with E. Galawish, L. Owashi, and R. Flood, Proceedings of the Seventh International Energy Program Evaluation, Chicago, IL. 1995

1994 and 1996 Measure Cost Studies, prepared for the California Demand-Side Management Measurement Advisory Committee. November, 1994 and December, 1996.

"Results of Measuring Spanish Technical and Economic DSM-Differences from North America," proceedings of the Second International Energy Efficiency and DSM Conference, Customer Focus, Stockholm, Sweden. September 21-23, 1993.

"DSM Planning the Next Generation: Building the Foundation through Evaluation," proceedings of the Sixth International Energy Program Evaluation, Chicago, IL. August 24-27, 1993.

"Can North America's Experience in DSM be Transferred to Europe? The Spanish Case," with A. Suárez and M. Hoffman, proceedings of the 1992 International Energy Efficiency and DSM Conference, Toronto, Canada. October 20-22, 1992.

DSM Seminars, series of five seminars on the history and current practice of demand-side management, presented at the Universidad Pontificia Comillas, Instituto de Investigacion Tecnologica, Madrid, Spain. November, 1991.

"Meeting Economic Growth through Greater Efficiency: Energy-Efficiency Potential in Southern California," with A. North and I. Chisti, proceedings of the Second International Conference on Energy Consulting, Graz, Austria. September, 1991.

Comparing DSM Technical Potential Studies, presentation to the California Utilities Research Council's Semi-Annual DSM Seminar, April, 1991.

Developing a DSM Potential Study, presentation to the California Municipal Utilities Association's Committee on Energy Efficiency, 1991.

"Strategic DSM Planning at Pacific Gas and Electric Company: Results, Methods, and Lessons Learned," with K. Warner and J. Fox, proceedings of the Enhancing Electricity's Value to Society Conference, Toronto. 1990.

"Comparisons of Predicted and Observed Energy Usage in Title-24 Homes," with K. Warner (principal author), proceedings of the American Council for an Energy-Efficient Economy 1990 Summer Study on Energy Efficiency in Buildings, Asilomar, CA.

An Assessment of the Potential for Electrical Energy-Efficiency Improvements in the SMUD Service Territory, prepared for the Sacramento Municipal Utility District, Sacramento, CA. July, 1990.

An Investigation of Commercial and Industrial Utility Demand-Side Management Program Impacts, Fourth International Energy Program Evaluation: Conservation and Resource Management Conference, Chicago, IL, August 23-25, 1989.

DSM Technology Assessment Study, Vols. I through IX, prepared for PG&E Company, May 1989.

"Measuring the Components of Regional Energy Conservation: Residential Natural-Gas Consumption in St. Louis," with M. R. Brambley, *Energy: The International Journal*, Vol. 14, No. 2, pp. 93-110, 1989.

"Performance of Cooling-Only and Heating-Only PRISM Models in Extreme Climates," with M.R. Brambley, American Council for an Energy-Efficient Economy 1988 Summer Study on Energy Efficiency in Buildings, Asilomar, CA. August 28-September 3, 1988.

"Comparing Regional Residential Natural-Gas Consumption Trends Using the Aggregate PRISM Model," with M. F. Fels and C. L. Reynolds, poster paper at the American Council for an Energy-Efficient Economy 1988 Summer Study on Energy Efficiency in Buildings, Asilomar, CA. August 28-September 3, 1988.

"Use of Commercial Energy Efficiency Measure Service Life Estimates in Program and Resource Planning," with F. Gordon (principal author), M. McRae, and D. Baylon, American Council for an Energy-Efficient Economy 1988 Summer Study on Energy Efficiency in Buildings, Asilomar, CA. August 28-September 3, 1988.

Technology Options and Potential for Energy Savings for Rhode Island Least-Cost Planning Project, contributing author, prepared for the Governor's Office of Energy Assistance, February 1988.

Service Life of Energy Conservation Measures, with M. McRae and D. Baylon, prepared for the Bonneville Power Administration, Final Report, July 14, 1987; summary article in the *ASHRAE Journal*, December 1988.

Residential Energy Conservation: Analyzing Changes in Consumption and Measuring Energy Savings, Masters Thesis, Washington University, St. Louis, MO. December 1986.

"Cogeneration Policy: Issues, Impacts, and Options," proceedings of the Sixth International Conference on Cogeneration, Orlando, FL. October 15-17, 1986.

"Mortgaging the Future," Op-Ed piece in the *St. Louis Post-Dispatch*, February 14, 1986, p. 3b.

"Meeting Low-Power Electrical Needs at Low Cost," proceedings of the Twelfth Annual Third World Conference, Chicago, IL. April 4, 1986.

Miriam L. Goldberg

EDUCATION

Princeton University, Ph.D., Statistics, 1982
Princeton University, MSE, Mechanical and Aerospace Engineering, 1980
Harvard University, BA, Mathematics, magna cum laude, 1975

EXPERIENCE HIGHLIGHTS

XENERGY Consulting Inc., Burlington, Massachusetts, 1992–Present
Vice President (1998–present)
Director of Consulting, Central Region (1995–1998)
Principal Consultant (1993–1995)
Senior Manager of Statistical Research (1992–1993)

Current projects for XENERGY include:

- Directing a technical assessment of alternate load profiling methodologies for an EPRI Tailored Collaborative.
- Managing the impact evaluations of several DSM programs around the country
- Serving as statistical reviewer and methodological adviser for various clients
- Conducting workshops and training on statistical methods for energy data collection and analysis
- Serving as chief statistical adviser for other XENERGY projects. In this capacity, contributing to methodology development for design of metering studies, sample design, billing analysis, and data integration.

U.S. Energy Information Administration (EIA), Energy End-Use and Integrated Statistics Division, Washington, DC, 1986–1992
Team Leader, Analytic Databases (1990–1992). Designed and directed innovative analytic projects to address crucial gaps in EIA consumption data sets. Developed methodology and supervised staff. Advised other teams on sample design, data analysis, and interpretation of statistical results. Worked toward unified approaches across surveys for different sectors.

Mathematical Statistician (1986–1990). Developed and implemented improved methods for design, data collection, and analysis of EIA energy consumption surveys, especially the Commercial Buildings Energy Consumption Survey (CBECS). Served as end-use expert for EIA's commercial and residential demand forecasting models, reviewing details of model formulation and suggesting new approaches.

U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1985–1986.
Statistician. Served as statistical consultant with respect to data interpretation and principles for establishing regulatory criteria and guidelines. Developed improved methodological approaches, with explication of issues for nonstatisticians.

University of Wisconsin, Madison, Wisconsin, 1982–1985
Principal Investigator, Statistical Laboratory (1984–1985). Conducted evaluations of Low-Income Weatherization programs in Wisconsin. Also consulted on various projects at the University and outside. Lecturer, Department of Statistics (1983–1985). Taught introductory statistics motivating understanding of and interest in statistical issues for humanities and social science majors, and for older students in extension school classes.

Research Associate, Mathematics Research Center (1982–1984). Unrestricted postdoctoral fellowship. Conducted independent statistical research on appropriate accuracy measures for nonlinear models.

FIELDS OF SPECIAL COMPETENCE

- Load Profiling and Settlement procedures for retail electricity markets
- Research Design: Data collection protocols, sampling, survey instrument design
- Monitoring and Verification for Performance Contracting
- Data Integration
- Statistical Modeling
- Impact Evaluation
- Training Courses

MAJOR PROJECTS

Managed the impact evaluation of PG&E's residential energy efficiency programs.

Co-chaired major conference on forecasting, load profiling, and settlement, Providence, RI, October 1997

Managed the evaluation of a 50 MW Bidding Program for Public Service Company of Colorado.

Managed the comprehensive evaluation of MidAmerican Energy's DSM programs.

Managed the development of segment-level end-use estimates based on existing audit data linked with external data sources, for Dayton Power and Light Company.

Managed the comprehensive evaluation of Consumers Power Company's DSM programs.

Developed integration methods for end-use metering and billing analysis for an EPRI Tailored Collaborative evaluating commercial rebate programs.

Conducted simulation studies of alternate methods of estimating net-to-gross savings ratios.

Managed the impact evaluation of Wisconsin Public Service Company's residential optional TOU rate.

Managed the development of a research plan for commercial data collection by audit and end-use metering for Entergy. The research plan included a nested sample design, sample selection, and an integrated analysis plan.

Managed the impact evaluation of Northern States Power Company's load management rates. The project included analysis of hourly load data to determine dispatchable impacts, and survey and on-site data collection to assess embedded impacts, for a curtailable load program.

Managed the research plan and analysis for an on-site study of persistence for Wisconsin Power and Light Company's small commercial rebate program

Managed the comprehensive evaluation of Iowa-Illinois demand-side management program

Mitchell Rosenberg

EDUCATION

BA Economics, Columbia University, 1974

Masters in City Planning, Harvard University, 1977.

EXPERIENCE HIGHLIGHTS

XENERGY Inc., Burlington, Massachusetts, 1992 - Present
Vice President for Consulting, Eastern Region, Directs energy efficiency program planning, marketing research and program evaluation work in XENERGY's main office.

Technical Development Corporation, 1980 - 1991
Vice President. Conducted process evaluations of residential conservation programs with particular emphasis on programs targeted to low-income customers; designed and managed numerous energy efficiency programs to serve institutional utility customers: government agencies, hospitals, universities, and non-profit organizations. Developed business plans for a variety of private and public ventures delivering energy efficiency products and services.

MAJOR PROJECTS

Energy Efficiency Program Potential and Planning

For a consortium of seven New Jersey electric and gas utilities, prepared a comprehensive analysis of energy efficiency and renewable resources for use in planning and regulatory assessment of energy efficiency programs in New Jersey. The analysis included characterization of energy efficiency and renewable resource measures and a forecast of market penetration of efficiency and renewables measures with and without program support. The final report provided a clear and well-supported set of proposals regarding the expenditure of funds collected by the utilities through the Societal Benefits Charge.

For Pacific Gas & Electric, co-managed a project to identify new program areas for market transformation efforts and a series of market studies to support the development of strategies to support particular efficiency products and services.

For the Massachusetts Division of Energy Resources, provided strategic consulting on negotiations with investor owned utilities to develop new, market-oriented energy efficiency programs during the transition to competitive electricity markets. Directed extensive policy and market analyses comparing program designs and incentive structures.

Energy Efficiency Product and Service Market Assessments

For the US Department of Energy (under subcontract to Lockheed Martin Energy Systems) directed a national study of electric motor use and systems and changes over time in the motor market. The study entailed on-site collection of motor inventory data for a probability sample of 300 factories nationwide, as well as extensive research on motor markets and technology. It is

also being used to assess the effects of DOE's Motor Challenge program on the transformation of the motor system markets.

For a variety of utility clients, directed market studies and feasibility assessments for new products and services. Studies covered a broad range of product and service areas, including equipment leasing and power quality consulting and equipment sales.

For a consortium of California utilities, directed project to estimate the market effects of long-standing programs to encourage the adoption of efficient lighting technologies by commercial customers. Research included extensive interviews with supply-side market actors, surveys of customers within and outside the program area, and document review.

For over two dozen clients including utilities, government agencies, and manufacturers, conducted market assessments for energy efficiency products and services in a broad range of technologies including lighting, HVAC, electric motors, compressed air systems, pumps, building controls, industrial controls, appliances, and energy performance contracting.

Program Evaluation

For a consortium of five New England Utilities, conducted a nationwide study of the effect of utility programs on customer acceptance and development of the markets for compact fluorescent lamps. The study also included an analysis of the net effects of the sponsors' programs on compact fluorescent lamp sales over a five year period.

For New England Electric Systems, directed annual evaluations of the Residential Lighting Program from 1991 to 2000. These evaluations assessed customer and retailer response to Compact Fluorescent Lamps and provided data on measure persistence, hours of use, and free ridership for the calculation of program impacts.

Directed comprehensive process evaluations of all demand-side management programs offered by the following utilities: Iowa Electric Power & Light, Iowa Southern Utilities, Iowa-Illinois Gas & Electric. These tasks involved the development and management of all customer survey activity, as well as staff and vendor interviews. Oversaw or wrote all sections on findings and recommendations to improve the cost-effectiveness of programs evaluated.

For the U. S. Environmental Protection Agency, directed a nationwide evaluation of the effects of the Energy Star labeling program on consumer recognition, understanding, and use of the Energy Star label in appliance purchase situations. The project also included studies of the effects of the program on markets for office equipment and residential heating and cooling equipment.

For a consortium of five New England Utilities, directed a methodological scoping study to develop an actionable research agenda to assess spillover and market transformation effects of DSM programs. The project encompassed a comprehensive literature review and analysis and the development of detailed project designs to apply appropriate research methods to assess spillover and market transformation in seven residential and commercial market segments.

For Boston Edison (now Nstar), Burlington (VT) Electric Department and others, designed, managed, and taught selected sessions of a training series on demand-side management program evaluation.

Program Design & Implementation

For the New York State Energy Research and Development Authority, developed and implemented a market transformation program to encourage and support compressed air and pump equipment distributors in selling energy efficiency related services.

For the New York State Energy Research and Development Authority, developed and implemented a market transformation program to encourage commercial HVAC contractors to use energy-efficient methods in specification, installation, and maintenance of packaged systems.

For Detroit Edison, designed, fielded and evaluated a comprehensive pilot energy efficiency program for the utility's low-income customers that covered installation of electric efficiency measures, consumer education on reducing electric usage; and negotiation of payment plans to limit arrearage. The pilot was highly successful and its design was adopted system wide to serve over 25,000 customers.

Energy Services Procurement

For the Massachusetts Operational Services Division directed analytical elements of an initiative to procure electricity and natural gas for all state facilities and selected local government agencies on a retail basis. This work involved the development of energy consumption and load shape estimates by local utility service territory for the aggregated group of facilities. Also authored a variety of policy documents to support this effort.

For the Massachusetts Division of Energy Resources, directed project to provide consulting services to municipalities, county government organizations, and industrial customers in the competitive purchase of natural gas. Deliverables included solicitation documents, case studies of aggregated purchases, and an analysis of the market for transport gas from the viewpoint of commercial and industrial customers.

For the New York State Energy Research and Development Authority managed a comprehensive effort to facilitate third party energy project development for school districts, municipal governments, and state agencies. Also oversaw of legal research, and the preparation of comprehensive guides to performance contracting in New York's public sector.

SELECTED PUBLICATIONS

Demand-Side Management Collaboration: A Comparative Evaluation, Edison Electric Institute and the US Department of Energy, 1992

Evaluation of the Demonstration Project on Principled Negotiation, Edison Electric Institute, 1990.

"Customer Response to Residential Lighting DSM: Findings from Two Years of Evaluation," *1993 International Energy Program Evaluation Conference Proceedings*, Chicago, 1993. (with Meredith Miller and Betty Tolkin)

"The Detroit Edison Low-Income Customer Service Program: Evaluation in Action," *1993 International Energy Program Evaluation Conference Proceedings,* Chicago, 1993. (with Jill Feblowitz)

"The Detroit Edison Low-Income Customer Service Program: Effective Methods to Reduce Non-Heating Energy Use," *1994 ACEEE Summer Study on Energy Efficiency in Buildings, Proceeding Vol. 1.*

"Strategies to Quantify Market Transformation and Spillover Effects of DSM Programs," *Energy Services Journal,* **1(2), 143-157**, 1995.

"Measuring Spillover and Market Transformation Effects of Residential Lighting Programs," *1996 ACEEE Summer Study on Energy Efficiency in Buildings, Proceedings.*

"The United States Motor Systems Market: Inventory and Baseline," *Proceedings, International Energy Agency,* Lisbon, 1997.

"The Market Effects of SDG&E's and PG&E's Commercial Lighting Efficiency Programs," *1998 ACEEE Summer Study on Energy Efficiency in Buildings, Proceedings.*

"The United States Motor Systems Market Assessment: Key Findings," *Proceedings of the 1999 International Energy Technology Conference,* Houston, 1999.

"Demand Reduction through Compressed Air System Efficiency," *Proceedings of the 1997 International Energy Program Evaluation Conference,* Salt Lake City, 2001.

"Lessons Learned from Demand Response Programs: Summer 2001," *Proceedings of the DistribuTech Europe Conference,* Berlin, 2001.

JULIE BLUNDEN

EDUCATION

Stanford Graduate School of Business, M.B.A., focus on marketing and finance, 1993-1995

Dartmouth College, A.B., engineering major with a certificate in environmental studies, 1984-1988

EXPERIENCE HIGHLIGHTS

XENERGY Inc, (Oakland, California), 2001 - Present
Vice President. strategic planning, finance, consumer marketing, operations, development, M&A, public affairs, renewable energy, fossil fuel plant permitting, fuel supply procurement.

Green Mountain Energy Company (1997-2001)
Leading retailer of cleaner electricity. Founding officer of the company, director of our first market launch—California. Architect of company decentralization and regional organization.

Green Mountain Energy Company, San Francisco, California, 1999-2001
President, Western Region. Leader of the $50 MM California business, responsible for profits and losses. Champion for Western Regional Team members and 40 other seasonal employees. Accountable for customer acquisition and retention, preserving and evolving our brand, regional operations, regulatory compliance, and product and business development.

Green Mountain Energy Company, Burlington, Vermont and San Francisco, California, 1998-1999
Vice President, Strategic Planning. Headed strategic planning efforts for financing and growth of the business. Directed extensive revisions to our business plan and financial model. Member of the IPO and private equity roadshow teams.

Green Mountain Energy Company, National Reach, 1998-1999
Vice President, New Markets. Developed regulatory and legislative priorities to ensure vibrant retail electric markets. Led a national public affairs campaign, advocating at legislative and regulatory hearings, conferences and workshops to support our public policy goals. Managed outreach to environmental and consumer advocacy communities.

Green Mountain Energy Company, San Francisco, California, 1997-1998
Regional Director, California. Collaborated with a wide range of market participants and stakeholders to create regulations and legislation implementing California's retail electricity market. Catalyzed and led negotiations with American Rivers to develop the Low Impact Hydropower Certification criteria, now being implemented nationwide. Directed all regional activities including support of supply negotiations, product design, marketing plans, public relations, utility relationships, and competitive intelligence. Acted as media spokesperson for extensive coverage of the first retail electric market.

The AES Corporation, Richmond, United Kingdom and San Francisco, California, 1995-1996
Development Manager. Negotiated the supply of domestic and international coal for AES' bid to purchase 4000 megawatts (MW) of National Power's generation capacity. Managed the financial

aspects of the San Francisco Energy Company, a $200 million, 240-MW, gas-fired cogeneration facility permitted for southern San Francisco.

Center For Energy Efficiency and Renewable Technologies, San Francisco and Sacramento, California, 1994
SMIF Funded Intern. Coordinated the response of California grassroots groups (environmental, consumer, low-income, minority, and business) and national energy advocates to the California Public Utilities Commission's electric utility industry restructuring plan. Directed media strategy for grassroots restructuring response at public hearings.

The AES Corporation, Kingston, Ontario, 1992-1993
Development Manager. Managed development strategy for the Kingston District Energy Project (KDEP), a $125 million gas-fired cogeneration plant and district energy system.

The AES Corporation, Honolulu, Hawaii, 1991-1992
Project Manager. Authored a study on the evolution of the energy services industry for a utility client. Consulted to a utility client on the preparation of its Integrated Resource Plan. Researched international potential for independent power and renewable energy.

The AES Corporation, Jacksonville and Ft. Pierce, Florida, 1988-1991
Development Manager. Directed environmental permitting of a $470 million clean coal-fired cogeneration facility including the two-year state hearing process, Federal Environmental Impact Statement preparation, and city council review procedure. Developed community relations strategy and achieved editorial board support.

FRED J. COITO

EDUCATION

University of California at Berkeley, M.B.A., 1987
University of California at Santa Barbara, M.A. in Economics, 1983
University of California at Santa Barbara, B.A. in Business Economics, 1981

EXPERIENCE HIGHLIGHTS

XENERGY Inc., Oakland, California, 1991-Present
Senior Project Manager, Utility Consulting. Lead analyst and project manager for utility research projects involving DSM impact evaluation, market assessment, forecasting, and planning. Oversee utility research projects involving market assessment, forecasting, and evaluation.

Pacific Gas and Electric Company, San Francisco, California, 1986-1991
Senior Energy Economist. Responsible for PG&E's short-term gas demand forecasts used to regulate filings and internal analyses. Developed econometric forecasting models and performed forecast-related analyses. Participated in regulatory proceedings before the California Public Utilities Commission and the Federal Energy Regulatory Commission. Testified in PG&E's General Rate Case, Cost Allocation, and Reasonableness proceedings.

Pacific Gas and Electric Company, San Francisco, California, 1983-1986
Energy Economist. Produced short- and long-term electricity demand forecasts using econometric and end-use models. Participated in proceedings and workshops before the California Energy Commission.

Applied Econometrics, Inc., 1983
Economic Consultant. Assisted in the development of commercial gas EUIs using conditional demand analysis.

San Diego Gas and Electric Co., San Diego, California, 1982-1983
Forecasting Intern. Developed a temperature-adjustment model for electricity sales and peak load.

HDR Sciences, 1980-1981
Junior Economist. Assisted in the development of a regional public finance model for Nevada, Utah, Arizona, and New Mexico. Econometric models were used to relate changes in the local economic to public sector revenues and expenses.

FIELDS OF SPECIAL COMPETENCE

- Econometrics
- DSM Impact Evaluation
- DSM Planning
- Forecasting and Demand Modeling
- Natural Gas Issues
- DSM Potential Analysis
- Regulatory Testimony

MAJOR PROJECTS

Evaluation of the 1997 and 1998 Industrial Energy Efficiency Incentive Programs, **PG&E.** Project Manager and Lead Analyst. Responsible for the day-to-day management of these large-scale projects involving the use of site-specific engineering analyses.

1996 and 1998 Residential New Construction Program Impact Evaluation, Pacific Gas and Electric Company. Project manager and lead analyst on these projects that each involved over 300 residential on-site surveys, building simulation analysis, and multi-staged billing analysis.

California Small and Medium Commercial Baseline/Choice Study, Multiple Clients, 1997. Assisted in the survey analysis and choice modeling portions of the project; wrote the final report.

1994-1996 Residential Retrofit Program Impact Evaluations, Pacific Gas and Electric Company. Assisted in all phases of these comprehensive evaluations, including database analysis, sample design, survey design, telephone and on-site survey implementation, and billing analysis.

1995 Direct Assistance Program Evaluation, Southern California Edison. Project manager and lead analyst for this project that involved on-site surveys and engineering analysis of CFL installations and telephone surveys and billing analysis of evaporative cooling and weatherization installations.

1994-1995 Commercial Retrofit Program Evaluation, Portland General Electric. Responsible for overall project management and leading the analysis portions of the evaluation including a billing analysis and a net-to-gross analysis of program savings.

1992-1993 Commercial Retrofit Program Evaluation, Portland General Electric. Responsible for leading the analysis portions of the evaluation including a billing analysis and a net-to-gross analysis of program savings.

ASD+1 Program Evaluation, Portland General Electric. Project manager of this engineering analysis of adjustable-speed drive measures and miscellaneous other DSM measures installed at the facilities of one large industrial customer.

Evaluation of 1994 Industrial HVAC and 1994 Industrial Process Incentive Programs, **PG&E.** Project Manager. Responsible for the day-to-day management of this large-scale project involving the use of numerous evaluation techniques for various end uses.

Commercial Lighting Impact Evaluation, PSI Energy. Conducted an econometric billing analysis of the commercial C3 program, a direct installation lighting program for small commercial customers. This study included survey instrument design, temperature adjustment of billing data, analysis of tracking system data, and econometric modeling.

Evaluation Plans for the Building Improvements Program, B. C. Hydro. Assisting in the development of impact evaluation plans for this nonresidential program. Plans include sample design, on-site survey development, and model specification for participation and SAE models.

Billing Analysis of the Nonresidential Retrofit Rebate Program, Pacific Gas & Electric. Conducted a billing analysis of Pacific Gas & Electric Company's nonresidential retrofit rebate program. Developed SAE models to estimate program realization rates for three customer classes (commercial, industrial, and agricultural) and two fuel types (electricity and natural gas). The

project included extraction and cleaning of data from PG&E's billing and program tracking system and conducting a telephone survey of program participants and a nonparticipant control group.

PROFESSIONAL AFFILIATIONS

International Association of Energy Economists

KATHLEEN MCELROY

EDUCATION

University of Pennsylvania, M.S., Energy Management and Policy/International Development, 1989
The American University, B.A. Economics and International Relations, 1987

EXPERIENCE HIGHLIGHTS

XENERGY Inc. (Oakland, California), 1999 - Present
Senior Consultant. Provide consulting and project management support in the areas of energy efficiency program planning, design, marketing and evaluation, market research design, market assessment, and performance measurement.

Hagler Bailly Services (Palo Alto, California), 1989-1999
Manager. Supported domestic utility consulting practice in the areas of market transformation program design, implementation and evaluation, new product and services design and marketing, market analysis and business case development, general management consulting, and retail services implementation support.

FIELDS OF SPECIAL COMPETENCE

- Energy efficiency program planning, design, marketing and evaluation
- Energy market assessment and analysis
- New product and service design and marketing
- Performance measurement

MAJOR PROJECTS

Process Evaluation of State of Wisconsin Focus on Energy Programs. Ms. McElroy managed the effort to conduct an overall process evaluation of the pilot and statewide Focus on Energy Program, implemented by the Wisconsin Department of Administration (DOA). This program encompassed a broad array of energy efficiency and renewables programs targeting residential, commercial, industrial and agricultural customers throughout Wisconsin. The evaluation involved in-depth interviews with key individuals involved in program administration, implementation, and evaluation. The final report provided recommendations for improvements in these areas.

Low Income Energy Efficiency (LIEE) Program Evaluation: Impact and Process Evaluation. Ms. McElroy is XENERGY's project manager for this comprehensive evaluation of California's statewide LIEE Program. This evaluation includes both a process and impact evaluation component. XENERGY conducted this evaluation for the 2000 program year, and is currently conducting an evaluation of the 2001 program year, including Rapid Deployment measures. The process evaluation involves the collection and review of data for the four California investor-owned utilities, and will provide an assessment of the internal processes of each utility's LIEE program in order to make mid-year program improvements where feasible and refine program plans for future program years. The impact evaluation provided the utilities

with first-year impacts for the 2000 program year, and will provide updated impact estimates for the 2001 program year and Rapid Deployment measures.

Evaluation of PG&E's 1-2-3 Cashback Program. Ms. McElroy is managing a process and impact evaluation of PG&E's umbrella 1-2-3 Cashback program, which offered residential customers with conservation tips and rebates for energy efficient appliances and other equipment. A specific analytic objective of this project is to determine the nature and frequency of no-cost energy efficiency actions in the population and the portion of which that can be linked to the 1-2-3 Cashback Program. This will involve assessing no-cost action incidence rates and performing an attribution analysis to identify which actions are linked to the Program. The process evaluation will examine differences in program-driven incidence rates for different measures, which may provide some objective evidence of the relative effectiveness of different program messages.

CA Statewide Residential Lighting and Appliance Study. Managed data collection and analysis activities for statewide, multi-phase market effects study of the IOU's lighting and appliance programs. Managed consumer telephone surveys, retailer and manufacturer in-depth interviews, and the development of market characterizations and program descriptions. Performed analysis on time series data and reported on market indicators and evidence of market effects.

Evaluation of ENERGY STAR® Awareness Campaign, Pacific Gas & Electric. In late 2000, PG&E launched a comprehensive, mass media advertising campaign to promote and raise awareness of the ENERGY STAR® brand throughout the utility's service territory. Ms. McElroy managed a pre-/post-campaign awareness study that determined the effectiveness of the effort in raising awareness, and conducted follow-on segmentation analysis to improve future advertising efforts. Ms. McElroy also assisted the utility's ad agency in planning and interpreting the results from a series of pre-campaign concept and creative testing focus groups. The ad agency also built on prior work conducted by Ms. McElroy for the CBEE that addressed baseline levels of public awareness and attitudes toward energy efficiency.

Assessment of Public Awareness and Attitudes Toward Energy Efficiency, California Board for Energy Efficiency (CBEE), Pacific Gas & Electric. This study involved a comprehensive statewide baseline survey of residential customers' awareness and attitudes toward energy efficiency, as well as a comparison survey of U.S. (non-California) households. This study was completed to lay the groundwork for analyzing and tracking public awareness and attitudes toward residential energy efficiency programs, products and services. Finally, this study has been useful in providing input for future program planning, design and marketing.

Market Effects Study for Refrigerators and CFLs, San Diego Gas & Electric, Pacific Gas & Electric. This study consisted of an assessment of the market effects attributable to SDG&E and PG&E Residential Appliance Efficiency Incentives Programs (featuring refrigerators and CFLs). It involved the review of industry/utility data, surveys with purchasers of refrigerators/CFLs in California and comparison areas, and interviews with manufacturers and major retail chains. The intent of the study was to assess the extent to which these utilities' programs have induced a market transformation of the residential energy efficient refrigerator and CFL markets. The study design effectively integrated the paradigms and definitions included within the current industry "thinking" on market effects indicators and measurement strategies.

Market Effects Study for Customer Technology Applications Center, Southern California Edison. This project involved a study of the market effects attributable to Southern California Edison's Customer Technology Applications Center (CTAC). This study involved the review of

industry/utility data concerning commercial and industrial lighting and HVAC technologies, surveys with CTAC seminar attendees, and interviews with manufacturers, distributors and vendors.

Design and Evaluation of Market Transformation Programs, Arizona Public Service Company (APS). This project involved the development of a plan for implementation of APS' residential and commercial market transformation programs. The underlying purpose of these programs is to minimize or eliminate known market barriers to the adoption of high-efficiency technologies in retrofit and new construction applications, and to achieve a transformed marketplace for energy efficiency in specific market areas. The program includes a performance measurement strategy designed to provide APS with feedback on the effects of the programs and the adoption of energy-efficiency measures. The performance measurement plan includes a set of indicators which will assist APS with making the decision as to when it is appropriate to exit from market intervention activities. The final product from this study identifies these performance indicators, specifies details regarding the measurement plan, and outlines the components of the exit strategy.

Evaluation of Residential Energy Services Programs, Pacific Gas & Electric. This project was originally awarded as a "standard" DSM process evaluation, involving two of PG&E's largest residential energy efficiency programs -- Direct Assistance (low income) and Energy Management Services (on-site, phone and direct mail energy audits). Since the project was initiated in 1996, its scope has expanded in a number of different ways. The current scope of the project now involves a critical assessment of PG&E's residential program designs and delivery strategies, including extensive internal interviewing and program background research as well as (at a minimum) about 1,500 customer surveys. PG&E is interested in research results that will provide them with a strategic plan for re-positioning, re-designing and/or re-aligning residential programs so as to most effectively meet customers' wants and needs. In addition, this plan will support decision making by senior management when called upon to demonstrate the future value of residential DSM programs delivered by PG&E.

Evaluation of Massachusetts Energy Conservation Service (ECS), Massachusetts Division of Energy Resources (DOER). This effort involved a comprehensive evaluation of the Massachusetts Energy Conservation Service (ECS), a program offering home energy audits and follow-up services to all residents of the state. This service is provided by all gas and electric investor-owned utilities (IOU) and municipal utilities in Massachusetts, and has been since 1980 per Massachusetts statute. Hagler Bailly's evaluation of the ECS Program was initiated by the Massachusetts Division of Energy Resources (DOER) to determine the need for program changes given the evolution of energy efficiency services in Massachusetts since 1980, and future changes anticipated from utility industry restructuring.

There were two primary objectives of the research: (1) to determine if the ECS program, as currently designed and implemented, achieves the goal of energy conservation in the most efficient manner, and (2) to identify ways in which the program could be modified to more effectively meet this goal, as well as meet the changing energy efficiency needs of Massachusetts residents throughout the transition to and after the utility restructuring. This evaluation involved a series of interviews with over 80 stakeholders with an interest in the ECS program; a survey with ECS participants to determine satisfaction and the extent of energy conservation actions; a needs assessment survey conducted with the general Massachusetts public to assess program awareness, energy efficiency needs, preferences for delivery mechanisms and levels of support; and impact analysis to determine the extent of energy savings attributable to the program; and a technical evaluation of the audit tool and education processes.

Product Development Support, Entergy. This effort produced a comprehensive set of marketing materials, sales tools, communication devices, training programs, and support systems for Entergy to roll out its latest set of 48 products and services. Entergy's Product Development Team wanted to take its preliminary list of new and existing products and services to complete development with all needed materials and support systems for full implementation. Working from its offices at Entergy for approximately six months, Ms. McElroy assisted in the definition, repackaging, and renaming of the products and services, and contributed to the development of over 100 deliverables to help market, communicate, and sell the products. As a follow-up to the project, an electronic version of the manuals and tools were developed.

Load Research Program Design and Review of DSM Action Plan, Ceylon Electricity Board (Sri Lanka). Ms. McElroy served as a consultant to the Sri Lankan Ceylon Electricity Board (CEB) to (I) formulate a load research program for implementation under the World Bank-financed Energy Services Delivery Project; and (ii) review and comment on the CEB's existing DSM Action Plan. McElroy spent three weeks in Colombo working with CEB's DSM and Electronic Data Processing (EDP) staff to identify, collect and analyze CEB's numerous customer energy-use data files for the purpose of developing the load research program sample design. The final sample design resulted in a well-constructed plan for collecting/analyzing load research data that is statistically representative of all customers, and stratified by region (province) and by tariff class. In preparing the sample design, Ms. McElroy developed an in-depth familiarity with CEB's central computerized billing database, as well as the process/procedures used to collect billing data in the field, enter this data electronically in the 50 CEB area offices, and transfer the data to CEB's head office in Colombo.

In addition, while in Colombo, Ms. McElroy provided the CEB with a review of its DSM Action Plan. This document identified key issues to be addressed prior to the implementation of the various activities described in the DSM Action Plan, as well as offered some specific refinements to the DSM Action Plan. Through this experience, Ms. McElroy gained considerable insight into the CEB's current plans and strategies for promoting DSM in all sectors (commercial, industrial and residential), which supplemented her existing knowledge of residential customer energy-use.

Residential Electricity Demand Assessment, World Bank Asia Alternative Energy Unit (ASTAE).
Ms. McElroy completed a residential sector energy study for World Bank ASTAE. The Urban-Rural Residential Electricity Consumption Assessment is one input into the development of a national DSM strategy. The research objectives of this project were to collect and analyze data on end-use consumption patterns of electricity and other fuels, and identify attributes that influence energy consumption behavior in Sri Lanka. In turn, this data was used to formulate recommended DSM strategies. Research focused on urban and rural households, and both electrified households and non-electrified households within the rural segment to assess significant differences in energy usage and its underlying explanatory variables. In addition, market research was conducted at a sample of residential appliance dealers in Sri Lanka to obtain information on the availability of appliances. Ms. McElroy also reviewed and incorporated key findings from the initial assessment of Commercial Building Sector Demand-side Management Potential to support a broader set of policy recommendations to be incorporated into national energy efficiency strategies. The report was published in May 1996 by the World Bank Asia Alternative Energy Unit (ASTAE).

DSM Manual for APEC Member Economies, Oakridge National Laboratory. Ms. McElroy co-authored a DSM manual for the APEC member economies, the purpose of which is to provide an overview of principles and practices of DSM. The manual is intended for a diverse audience,

including electric utility staff; government officials responsible for energy, finance, industry, housing, and planning; energy equipment manufacturers, dealers, and contractors; non-governmental organizations (NGOs); international lending agencies; and the general public. The primary audience for the manual is utility personnel who are new to DSM, and are looking for an overview on DSM. Executives as well as technicians should benefit from this report. In some instances, even DSM specialists may derive some benefit from it, through a review of material that deals with topic areas other than their own. They might also benefit from a reading of the various case studies that appear throughout the report, describing the experience of various APEC economies.

Process and Impact Evaluation of Residential Utility Low Income Energy Efficiency Program (ULIEEP), Brooklyn Union Gas. Ms. McElroy completed a comprehensive three-year Process and Impact Evaluation of Brooklyn Union Gas Company's (Brooklyn Union) Utility Low Income Energy Efficiency Program (ULIEEP). This program provides cost-effective gas DSM measures to residential low-income customers through an audit and direct installation mechanism. This evaluation entailed a systematic assessment of whether or not the program is operating according to its design, and whether it has achieved the desired goals and objectives. It also involved the analysis of a wide range of issues with numerous primary data sources, such as customer billing histories, customer surveys and focus groups, program tracking data, and interviews with key contributors to the program design and implementation. Ms. McElroy also directed the activities related to the statistically adjusted engineering (SAE) analysis of program impacts, review of program audit software and results, and an (optional) cost-effectiveness evaluation.

Integrated Analysis of Market Response to Various Programs, Wisconsin Demand-Side Demonstration. Ms. McElroy contributed to the writing of a series of thematic reports using cross-cutting analysis from the wealth of information provided by the seven community-based programs and six other technology-oriented DSM programs, including a statewide motors program, HVAC programs, and lighting demonstrations. These thematic reports include topics such as: market transformation, partnering with trade allies, response to community-based programs, targeting the residential market, and the use of financial and nonfinancial incentives.

Evaluation of New London Resource Project, Wisconsin Demand Side Demonstrations. Ms. McElroy managed the evaluation of a community-based energy efficiency program targeted toward residential, commercial and industrial customers in New London, Wisconsin. This program was one of six community-based demonstration projects conducted by Wisconsin Demand-Side Demonstrations. The purpose of the program was to demonstrate that a community-based, energy efficiency program that is planned and delivered with substantial community involvement will produce more long-term conservation at a lower cost than existing utility energy efficiency programs. The evaluation effort incorporated feedback from sponsoring utility staff and contractors, local community advisory committee members, participants and trade allies. The evaluation findings were also supported by a number of commercial and residential baseline studies and trade ally stocking surveys previously completed.

Communities as a Resource for Promoting Energy Efficiency: Lessons Learned from Wisconsin Community-Based Programs, Wisconsin Demand-Side Demonstrations. Ms. McElroy contributed to the integration of findings from the evaluations of six Wisconsin community-based demonstration projects conducted by Wisconsin Demand-Side Demonstrations, Inc. (WDSD). Each of the programs were evaluated separately and incorporated a diverse set of features and design parameters. The objective of the integration analysis was to establish a framework for planning, administering, promoting, marketing, and implementing successful

community-based marketing programs based on the “lessons learned” from the demonstration projects.

Conjoint Analysis of Insulation Program Designs, Pacific Gas & Electric. Ms. McElroy managed a conjoint analysis of PG&E's insulation program designs. This project involved the use of a telephone-mail-telephone data collection technique, through which customers' preferences for specific program design elements were tested. The results of the conjoint analysis were used by PG&E program planners to modify existing program designs to ensure both customer acceptance and cost-effectiveness.

DSM Evaluation Workshop, Dayton Power & Light. As part of a team of instructors, Ms. McElroy presented a training seminar on the use of operational audits, as performed as part of DSM Process Evaluations. The training seminar was conducted for Dayton Power & Light, as the utility embarks on a multi-million dollar marketing effort. Also presented during this training workshop were the following seminars: Market and Marketing Evaluations; Program Monitoring and Performance Tracking Issues; Evaluating Special Program Types (i.e., low-income programs, ESCO-delivered programs, comprehensive/bundled programs); Externality Impact Issues; and, Evaluation Planning and Design.

Siting of Low-Level Radioactive Waste Disposal Facility, Chem-Nuclear Systems, Inc.
Ms. McElroy assisted in the conduct of a series of 12 focus groups in the six DER regions of Pennsylvania to facilitate public involvement in the siting of a low-level radioactive waste disposal facility. The focus groups were used to: (l) develop a survey research instrument to provide an analytical basis for public input into the weighting of factors to be later used in the evaluation of potential sites; (2) assess public awareness of low-level waste and of the Commonwealth's plans for developing a facility; and (3) solicit additional methods and means for involving the public in the siting process.

Testing of Print Advertisements for Utility Marketing Programs, Atlantic Electric Company.
Ms. McElroy was responsible for the analysis and interpretation of results of 150 surveys testing residential customer reactions to Marketing program print advertisements for Atlantic Electric Company. The ads compared three advertising approaches for three separate programs involving time-of-use rates, energy-efficient home ratings, and direct load management.

Commercial/Industrial Waste Reduction and Recycling Clearinghouse Services, New York State Department of Economic Development. Ms. McElroy assisted in the assessment of the specific needs of a clearinghouse program in support of commercial and industrial waste reduction and recycling. Ms. McElroy directed the conduct, and analysis and interpretation of results of over 100 in-depth telephone interviews with potential clients of a clearinghouse, particularly, those who already have established waste reduction/recycling programs. Ms. McElroy also assisted in developing the methodology to be used in assessing the relative importance of all client groups (i.e., the intersection of a region and a business activity) with respect to the use of these services.

Residential Utility Customer Reactions to Energy Conservation and Marketing Advertisements, Philadelphia Electric Company. Ms. McElroy was responsible for the analysis and interpretation of results of several focus groups with residential customers. The purpose of the study was to test customer reactions to sample television, radio and print advertisements to determine whether messages promoting energy conservation and messages promoting the use of heat pumps could be aired simultaneously without creating confusion or

conflict in customers' minds. Ms. McElroy was responsible for the analysis and interpretation of results, as well as writing the final report.

Exploration of Residential Customer Reactions to Electric Thermal Storage Systems, Atlantic Electric Company. Ms. McElroy directed the analysis and interpretation of results of two focus groups with residential customers of Atlantic Electric. The purpose of this research was to test both electric and non-electric heat customer reactions to electric thermal storage heating systems. The results from the focus groups were used to help design and interpret the results of a telephone survey.

STEVEN J. GIAMPAOLI, P.E.

EDUCATION

University of California, Davis, B.S. in Mechanical Engineering, 1975
State of California, Registered Professional Mechanical Engineer, M018645, 1977

EXPERIENCE HIGHLIGHTS

XENERGY, Oakland, CA, 1997 - present

Chief Engineer of XENERGY's commercial, industrial, and agricultural business services for the Western Region. Administers development and implementation of energy auditing, program impact evaluation, and performance contracting projects for demand side management activities.

- Directs energy auditing teams for commercial, industrial, utility, institutional, and government clients.
- Evaluates and designs energy efficiency measures for industrial and commercial sites.
- Performs independent third-party review of utility industrial and commercial energy efficiency rebate programs.
- Consults with industrial and commercial clients on energy efficiency and energy cost reduction measures.
- Develops client proposals and contracts for performance contract projects.
- Negotiates, and administers energy performance contracts for, installation of energy efficiency measures in buildings and industrial processes.

UNOCAL Corporation, Los Angeles, CA, 1995 - 1997

Manager of Operations, Pipelines and Terminals. Administered operation of UNOCAL's system of crude gathering lines, common carrier crude trunk lines, product distribution pipelines, and product terminals in Southern California, Arizona, and Southern Nevada.

UNOCAL Corporation, Wilmington, CA, 1993 - 1995

Reformulated Fuels Project Manager. Headed $350 million refinery modification project to comply with Clean Air Act of 1990 at UNOCAL's 125 MB/D Wilmington, CA refining complex. Project scope included a new hydrogen plant, a new isomerization and benzene saturation plant, new storage tanks, new gasoline and midbarrel blenders with advanced computer control, major distillation revamps to the Hydrocracker, Fluid Cat Cracker and Alkylation units, new high-voltage refinery feeds, substations, and electrical distribution system, along with other necessary off-site facilities and utilities.

UNOCAL Corporation, Wilmington, CA, 1988 - 1993

Refinery Maintenance Manager. Directed refinery maintenance and turnaround activities at UNOCAL's 125 MB/D refining complex in Wilmington, CA. Supervised company work force of 150 supervisors, union craftsmen, planners, engineers, and clerks and 200 contractor craftsman on a daily basis.

UNOCAL Corporation, Wilmington, CA, 1975 - 1988

Various assignments of increasing scope and responsibility including:

- Supervisor, Mechanical Department: Supervised refinery machinery maintenance department
- Supervisor, Heavy Metals Department: Supervised refinery piping and pressure vessel maintenance department
- Supervisor, Construction: Supervised refinery construction department for capital projects
- Product Coordinator/STOP Planner: Planned and scheduled product and crude shipments for UNOCAL's west coast refining system

- Project Engineer: Responsible for engineering design for refinery capital projects

FIELDS OF SPECIAL COMPETENCY

- Energy use evaluation in industrial and commercial facilities; measurement and verification techniques; energy conservation measure impact analysis; energy conservation measure development; and facility program implementation.
- Technical consultant for industrial process equipment, control system, and electrical distribution improvements.
- Technical consultant for operational and maintenance practices in industrial facilities involving rotating machinery, electrical generation and distribution, furnaces and boilers, heat transfer equipment, control systems, piping and pumps.
- Technical consultant on industrial and commercial equipment reliability improvement techniques and programs.
- Technical consultant on industrial and commercial equipment commissioning and startup methods.
- Project management and design of new and revamped installations for industrial facilities including all phases of design, permitting, procurement, contracting, scheduling, construction, quality control, commissioning, training and startup.

Impact Evaluations:

Impact Evaluation of Pacific Gas & Electric's 1997 Industrial Process Measures. Developed analytical methodology for individual sites, field measurement strategies, and site-specific analysis techniques for complex interactive industrial energy conservation measures. Conducted individual site evaluation activities.

Impact Evaluation of Pacific Gas & Electric's 1997 Commercial Process Measures. Developed analytical methodology for individual sites, field measurement strategies, and site-specific analysis techniques for complex interactive commercial energy conservation measures. Conducted individual site evaluation activities.

Impact Evaluation of San Diego Gas & Electric's 1997 Industrial Efficiency Incentives Program. Developed analytical methodology for individual sites, field measurement strategies, and site-specific analysis techniques for complex interactive industrial energy conservation measures. Conducted individual site evaluation activities.

Impact Evaluation of Portland General Electric's 1996-1997 Industrial Retrofit Program. Developed analytical methodology for individual sites, field measurement strategies, and site-specific analysis techniques for complex interactive industrial energy conservation measures. Conducted individual site evaluation activities.

Energy Efficiency Studies:

City of Mountain View, Synergy Semiconductors, Carlsbad Research Center, Owens-Brockway, Portland. Identified and evaluated energy saving potential for various commercial and industrial facilities. Investigated motors, HVAC, compressed air systems, DHW, and lighting retrofit possibilities. Conducted site surveys, developed computer simulations, estimated project costs, and presented results.

Industrial Substations. Project manager for 115 kV substation project at Owens-Brockway, Oakland, CA and 230 kV utility substation at Owens-Brockway, Lakeland, FL. Completed facilities provided substantial improvements in power quality and reductions in annual electrical costs for transmission level service.

PROFESSIONAL AFFILIATIONS

American Society of Mechanical Engineers (ASME), Member

Pacific Energy Association, past President

Western Consumers Training Trust, past President

RICHARD S. RIDGE

EDUCATION

University of Southern California, Ph.D. in Public Administration, 1981

Marian College, Indianapolis, Indiana, B.A. in English, 1968

EXPERIENCE HIGHLIGHTS

XENERGY Inc, Oakland, California, 1998 - Present
Provide consulting support in impact and process evaluations of energy conservation, load management, and market transformation programs, DSM and business forecasting, and customer choice analysis.

President, Ridge & Associates, Alameda, California, 2/95 - Present
Responsible for market research, impact and process evaluations of energy conservation, load management, and market transformation programs, as well as DSM and business forecasting. Also, provide on-going consulting for the Modeling Subcommittee and Base Efficiency Subcommittee, California DSM Measurement Advisory Committee (CADMAC), the Southern California Edison Company, the Korea Energy Economics Institute, and Xenergy Inc.

Vice President, Pacific Consulting Services, Albany, California, 3/94- 2/95
Responsible for impact and process evaluation of energy conservation and load management programs, DSM and business forecasting, and market research. Also responsible for proposal preparation, marketing, and project management.

Southern California Edison Co., Rosemead, California, 8/91 - 2/94
Supervisor, Nonresidential DSM Evaluation, Energy Efficiency and Marketing Services (EE&MS) Department.
Primary responsibility for the evaluation of all conservation and load management programs as well as electro-technologies. This includes the evaluation of net effects, cost-effectiveness and implementation. Provide evaluation consultation on such issues as demand-side bidding and integrated resource planning. Prepare testimony regulatory forums. Represented Edison at the Measurement and Evaluation Workshops and the hearings that followed that were a part of the DSM OII/OIR conducted by the California Public Utilities Commission. Represent Edison on the California DSM Measurement and Advisory Committee. Chair the Statewide Study on Modeling Standards for End-Use Consumption and Load Impact Models. Also serve on the state-wide Persistence and Base Efficiency Studies.

Southern California Edison Co., Rosemead, California, 6/89 - 8/91
Planning Engineer, Engineering, Planning and Research Department. Primary responsibility for developing plans for the strategic use of conservation and load management in system planning. Also responsible for long-rang DSM forecast as well as the integration of demand-side and supply-side resources. Participated in the development of the "Measurement Protocols For DSM Programs Eligible For Shareholder Incentives."

Southern California Edison Co., Rosemead, California, 1/87 - 6/89
Forecast Specialist, System Planning and Research Department. Primary responsibility for forecasting
economic variables such as personal income and gross state product for California. Also responsible for the forecasting of customers by rate class for the Edison service territory as well as the small-area forecasting of electricity demand.

Southern California Edison Co., Rosemead, California, 10/82 - 1/87
Research Analyst, System Development Department. Primary responsibility for the evaluation of conservation and load management programs as well as the systematic examination of alternative resource plans. Also the direction and design of quality control studies.

Management Consultant, Pasadena, California, 2/82 - 10/82
Provide consultation in organizational development, evaluation, data processing and grantsmanship.

University of Southern California, College of Continuing Education, Los Angeles, California,
7/79 - 2/82
Director, Office of Research and Evaluation. Direct all evaluation and market research within the College. Conduct all statistical analysis. Provide technical assistance in planning and proposal development.

MAJOR PROJECTS

Evaluation of 1995 & 1996 Industrial Programs, PG&E
Led net-to-gross analysis.

CBEE/SCE Evaluation of Nonresidential Standard Performance Contract.
Assisted in net-to-gross analysis and report development for this project.

1999 Retail Wheeling Multi-Client Study, Phase 4
Developed and analyzed nonresidential revealed preference choice models for Phase 1 opening of Pennsylvania's competitive retail electricity market.

FIELDS OF SPECIAL COMPETENCE

- Research methods
- Survey research
- Evaluation of energy conservation programs
- Evaluation of load management programs
- Forecasting
- Decision analysis
- Evaluation of educational programs
- Market research
- Evaluation of market transformation programs
- Testifying at regulatory DSM proceedings
- Preparing regulatory testimony
- Strategic DSM planning

- Integrated resource planning
- Project management

REPORTS, PUBLICATIONS, AND PRESENTATIONS

Ridge, Richard. “Recent Methodological Advances in Estimating Net-to-Gross Ratios Based on the Self Reports of Program Participants.” In preparation, August, 1999.

Ridge, Richard. “To Weight or Not to Weight in Multiple Regression: Is That the Question?” In preparation, July, 1999.

Ridge, Richard. “Random Error in Regression Models.” In preparation, June, 1999.

Ridge, Richard. “Sample Size in DSM Evaluation: A Primer on Power Analysis.” In preparation, July, 1999.

Barnes, Rich, Kenneth Train, Mike Rufo, and Richard Ridge. “The Use of Qualitative Choice Analysis in Forecasting.” A presentation at the EPRI Forecasting Conference, March 1999.

Ridge, Richard, Sam Cohen, and Marc Schuldt. “Strategies for Aggregating Small Commercial and Industrial Customers for Participation in PG&E’s Standard Performance Contracting Program.” Presentation given at PG&E’s Learning Center in November, 1998.

Ridge, Richard. “Measurement Error in SAE Models: Close Encounters of the Third Kind.” Paper presented at the National Energy Program Evaluation Conference, August, 1997.

Baker, Michael, and Richard Ridge. “A Comprehensive Evaluation of PG&E’s 1995 Industrial Incentive Program.” Paper presented at the National Energy Program Evaluation Conference, August, 1997.

Ridge, Richard. “Billing Analysis, Discrete Choice Analysis, and Related Issues.” A presentation made to the CADMAC Fall Forum in November, 1996.

Ridge, Richard. “Self-Selection: A Brief CADMAC History and Current Concerns.” A presentation made to the CADMAC in October, 1996.

Baker, Mike, and Richard Ridge. “A Comprehensive Evaluation of a Commercial Rebate Program.” A paper presented at the American Council for and Energy Efficient Economy Conference in August, 1996.

Randazzo, Katherine, and Richard Ridge. “How Many Mills Ratios Does It Take to Estimate Net Impacts?” A paper to be presented at the American Council for and Energy Efficient Economy Conference in August, 1996.

Ridge, Richard, Dan Violette, and Don Dohrman. "Quality Assurance Guidelines for Statistical and Engineering Models." Published by the Association of Energy Services Professionals (AESP), May, 1996.

Ridge, Richard, Kirtida Parikh, Dan Violette, and Don Dohrman. "An Evaluation of Statistical and Engineering Models for Estimating Gross Energy Impacts." Published by the Association of Energy Services Professionals (AESP), May, 1996

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Ridge, Richard and Bruce Mast. "The New Construction Conundrum: Without a Baseline, How Can There Be a Gross?" Presented at the National Energy Program Evaluation Conference in Chicago, August 22, 1995.

Ridge, Richard, Dan Violette, John Peterson, and Don Dohrman. "Standards for Measurement and Evaluation: The California Experience," Presented at the DA/DSM Conference in San Jose, California on January 24, 1995.

Atherton, Terry, Caroline Chen, Richard Ridge, and Kenneth Train. "A Model of appliance Efficiency Choice Using Stated and Revealed Preference Data." A paper presented at ACEEE Summer Study on Energy Efficiency in Buildings, 1994.

Ridge, Richard, Dan Violette, and Don Dohrman. "Quality Assurance Guidelines for Statistical and Engineering Models." Report prepared for the California Demand-Side Management Advisory Committee: The Subcommittee on Modeling Standards for End-Use Consumption and Load Impact Models, November, 1994.

Ridge, Richard. "The Table 11 Test: Results of Edison's Experience." Paper presented at the California DSM Measurement Advisory Committee Fall Forum held in Folsom, California, June 1994.

Ridge, Richard, Kirtida Parikh, Dan Violette, and Don Dohrman. "An Evaluation of Statistical and Engineering Models for Estimating Gross Energy Impacts." Report prepared for the California Demand-Side Management Advisory Committee: The Subcommittee on Modeling Standards for End-Use Consumption and Load Impact Models, June 1994.

Ridge, Richard. "Comparison of Other Utility Experiences with Table 11 Requirements." Served as chair of a panel at the California DSM Measurement Advisory Committee Fall Forum held in Folsom, California, June 1994.

Ridge, Richard. "An Analysis of Table 11 in the Protocols and Procedures for the Verification of Costs, Benefits, and Shareholder Earnings from Demand-Side Management Programs." A report prepared for the Southern California Edison Company, March, 1994.

Ridge, Richard. "Commercial Gross Impacts Reconciliation." Paper presented at the California DSM Measurement Advisory Committee Fall Forum held in Aptos, California, November 4, 1993.

Ridge, Richard. "Nonresidential Retrofit Measurement Issues." Served as chair of a panel at the California DSM Measurement Advisory Committee Fall Forum held in Aptos, California, November 4, 1993.

Ridge, Richard, and Katherine V. Randazzo. "Overview and Analysis Plan for Estimating Gross Impacts in the Commercial Sector." Report submitted to the California Public Utilities Commission, September, 1993.

Ridge, Richard. DSM Measurement And Monitoring. Presentation given in Santa Fe, New Mexico at the Integrated Resource Planning Training Series sponsored by the Western Area Power Administration on September 1, 1993.

Ridge, Richard, "Achieving Consistency Among Multiple Estimates of DSM Savings." Paper given at the National Energy Program Evaluation Conference held in Chicago on August 24-27, 1993.

Ridge, Richard, "Triangulation and Budget Constraints in the Evaluation of Large Non-Residential DSM Programs." Paper given at the National Energy Program Evaluation Conference held in Chicago on August 24-27, 1993.

Ridge, Richard. "DSM Evaluation and Monitoring." Presentation given in San Francisco at the Integrated Resource Planning Training Series sponsored by the Western Area Power Administration on April 16, 1992.

Ignelzi, Patrice, Bruce Mast, Richard Ridge, Taghi Alereza, and Kenneth Train, "Program Impact Evaluation: Adding Engineering Estimates to the Equation." Paper presented at the 6th National Demand-Side Management Conference held on March 24-26 in Miami Beach, Florida.

Ridge, Richard. "Evaluation Plan for the Commercial, Industrial and Agricultural Hardware Rebate Program," Paper presented at the California Utility Research Council Conference held in Monterey, California, April 7, 1992.

Ridge, Richard and Ishtiaq Chisti. "Common Forecasting Methodology IX: Demand Forms," Submitted by the Southern California Edison Company to the California Energy Commission on July 15, 1991.

Chisti, Ishtiaq, Richard Ridge, and Arthur Canning, "DSM Forecasting for Integrated Resource Planning." Paper presented at the conference, "Forecasting: The Foundation of Planning," held in Baltimore, Maryland, October 23-25, 1991.

Richard Ridge, "Sample Design for the 1991 Commercial, Industrial and Agricultural Energy Use Survey," Paper presented at the California Utility Research Council Conference held in San Diego, California, September 26 & 27, 1991.

Ridge, Richard, Gary Stern, and Ronald K. Watts. "Econometric Model Evaluation: Implications for Program Evaluation," *Evaluation Review*, June, 1989.

Hoover, Michael, James Garces, and Richard Ridge. "Demand-Side Bidding: A Practical View." Paper to be presented at the conference, "Enhancing Electricity's Value To Society," held in Toronto, Canada on October 22-24, 1990.

Ignelzi, Patrice C., and Richard Ridge. "The Evolution of Rebate Programs: From Conservation to Customer Service Through Demand-Side Management." Paper presented at the conference, Demand-Side Management, held in Cincinnati, Ohio, May 2-4, 1989.

Stern, Gary, Pam Sorooshian, Richard Ridge, and Ronald K. Watts. "Reducing Household Electricity Consumption Peaks," Sociology and Social Research, July, 1988.

Ridge, Richard. "Energy Conservation for Low-Income Families: The Evaporative Cooler Experience," *Evaluation Review*, April, 1988.

Ridge, Richard, and Ronald K. Watts. "Reducing Dependence on Central Electric Heating Systems: An Evaluation of an Experimental Program," *Evaluation Review*, June 1987.

Ridge, Richard. "An Analysis of Various Types of Home Energy Audits," *Evaluation Review*, June 1986.

Ridge, Richard. "An Evaluation of One Warm Room: An Experimental Program Designed to Determine the Effect of a Portable Electric Heater on kWh Consumption in Houses with Central Electric Heating," proceedings from the ACEEE 1984 Summer Study on Energy Efficiency in Buildings, Volume K: Improving Methods of Program Evaluation (Special Topics), August 1984.

SELECTED RESEARCH REPORTS

Ridge, Richard. "The Examination of Commercial Customers' Choice of Electricity Suppliers Using Qualitative Choice Analysis." Prepared for Xenergy Inc., March 1999.

Ridge, Richard, Katherine Randazzo, and Richard Sterrett. "Evaluation of Southern California Edison's 1997 Industrial Energy Management Hardware Rebate Program." Submitted to the Southern California Edison Company, March 1, 1999.

Ridge, Richard and Katherine Randazzo. "Evaluation of the Southern California Edison Company 1997 DSM Bidding Program." Submitted to the Southern California Edison Company, March 1, 1999

Ridge, Richard. “Sample to Support Southern California Edison’s Verification Study of the 1998 Commercial, Industrial, and Agricultural Energy Management Hardware Rebate Programs.” Submitted to the Southern California Edison Company, March 10, 1999.

Ridge, Richard. “Sample to Support Southern California Edison’s 1998 Standard Performance Contracting Program.” Submitted to the Southern California Edison Company, March 5, 1999.

Ridge, Richard and Katherine Randazzo. “Evaluation of the Southern California Edison Company 1996 DSM Bidding Program.” Submitted to the Southern California Edison Company, April 24, 1998.

Ridge, Richard. “Sample to Support Southern California Edison’s Verification Study of the 1997 Commercial, Industrial, and Agricultural Energy Management Hardware Rebate Programs.” Submitted to the Southern California Edison Company, March 13, 1998.

Ridge, Richard, Katherine Randazzo, and Michael Baker. “Evaluation of Pacific Gas and Electric’s 1996 Industrial Energy Efficiency Incentives Program.” Submitted to PG&E February 23, 1998.

Ridge, Richard, Katherine Randazzo, and Richard Sterrett. “Evaluation of Southern California Edison’s 1996 Industrial Energy Management Hardware Rebate Program.” Submitted to the Southern California Edison Company, February 23, 1998.

Ridge, Richard, Michael Baker, and Katherine Randazzo. “Customer Load Control Evaluation To Confirm and Optimize Available Load Reduction.” Submitted to the Korea Energy Economics Institute, July 1997.

Baker, Michael and Richard Ridge. “Evaluation of PG&E’s 1995 Industrial Energy Efficiency Incentives Program,” sponsored by the Pacific Gas & Electric Company, January, 1997.

Ridge, Richard, Robert Uhlaner, and Bing Xia. “Assessment of the Sampling Requirements Contained in the CPUC Measurement and Evaluation Protocols,” sponsored by the California Demand-Side Management Advisory Committee, June, 1996.

SBW Consulting and Ridge & Associates. “1994 Commercial HVAC Impact Evaluation,” sponsored by the Pacific Gas & Electric Company, March, 1996.

SBW Consulting and Ridge & Associates. “1992-93 Nonresidential New Construction Programs: Gross and Net Impact Analysis Incorporating Summer End-Use Metering Data,” sponsored by the Pacific Gas & Electric Company, March 29, 1996.

SBW Consulting and Ridge & Associates. “1992-93 Nonresidential New Construction Programs: Statistical Analysis of Gross Impact,” sponsored by the Pacific Gas & Electric Company, August 15, 1995.

“The Measurement and Evaluation of DSM Programs: A Training Program for the Korea Energy Economics Institute,” sponsored by the Korea Energy Economics Institute October, 1995.

“Research Plan for the 1994 Commercial HVAC Impact Evaluation,” sponsored the Pacific Gas and Electric Company, 1995.

“Research Plan for the 1994 Commercial New Construction Impact Evaluation,” sponsored the Pacific Gas and Electric Company, 1995.

“Research Plan for the 1994 Industrial Impact Evaluation,” sponsored the Southern California Edison Company, 1995.

“Research Plan for the 1990 Commercial HVAC Impact Evaluation,” sponsored the Southern California Edison Company, 1992.

"The 1989 Division Load Forecast, sponsored by the Southern California Edison Company, 1989.

"The 1989 A-Station Forecast," sponsored by the Southern California Edison Company, 1989.

"The 1989 Customer and Meter Forecast," sponsored by the Southern California Edison Company, 1989.
"Forecast of Economic Variables," sponsored by the Southern California Edison Company as part of its report to Public Utilities Commission concerning the Common Forecasting Methodology, 1987.

"An Evaluation of the Air Conditioner Cycling Program to Determine the Net Load Management Effect," sponsored by the Southern California Edison Company, 1986.

"An Experiment to Determine the Relative Effectiveness of Alternative Marketing Strategies for the RSVP Audit for Commercial and Industrial Customers," sponsored by the Southern California Edison Company, 1986.

"An Analysis of Non-Response Bias Due to Unlisted Telephone Numbers Within the Edison Service Territory," sponsored by the Southern California Edison Company, 1986.

"An Econometric Analysis to Determine the Net Effect of the Second Refrigerator Program," sponsored by the Southern California Edison Company, 1985.

"Reasons for Non-Continuation of Former Students and Non-Registration of Those Who Inquired About Adult Education Classes," a market research report sponsored by the College of Continuing Education, University of Southern California, 1983.

"A Survey and Assessment of the Department of the Army Basic Skills Education Program Phase II, as Conducted at Fort Lewis, Washington, 6 July - 3 September, 1982," an evaluation sponsored by the Department of the Army, 1982.

"Fall 1981 Client Marketing Report," a market research report sponsored by the College of Continuing Education, University of Southern California, 1982.

"Career Advisement, Adult Education and Network Training for Paraprofessional and Peer Counselors Who Work with Unemployed and Underemployed Indochinese Refugees," an evaluation sponsored by the California Postsecondary Education Commission, 1981.

"A Training of Trainers Program for Adult Educators in Community Settings," an evaluation sponsored by the Office of Education, 1980.

"Freshman Summer Experience," an evaluation sponsored by the College of Continuing Education, University of Southern California, 1980.

"Community Organization Management Training Program," an evaluation sponsored by the California Postsecondary Education Commission, 1978.

EXPERT TESTIMONY

Support utility witnesses in the Annual Earnings Assessment Proceedings in California, 1994–1999

PROFESSIONAL AFFILIATIONS

Member, AESP Evaluation Topic Committee
Member, American Marketing Association
Member, American Management Association
Member, American Evaluation Association
Member, Association of Energy Services Professionals (AESP)

LESLIE D. OWASHI

EDUCATION

San Diego State University, M.B.A., Management Science, Financial Theory, and Quantitative Financial Analysis, 1982
University of California at San Diego, B.A. in Biology, 1975

EXPERIENCE HIGHLIGHTS

XENERGY Inc., San Diego, California, 1990-Present
Senior Manager. Responsible for program implementation and analyses, market research, and data and systems management. Manage data collection projects requiring a variety of data gathering techniques. Provide research and analysis planning and consulting. Experience in designing research programs for tracking, evaluation, and program design, including the integration of tracking and evaluation systems into program designs. Extensive background in information systems from a user perspective.

San Diego Gas & Electric, San Diego, California, 1982-1990
1990, Evaluation and Analysis Supervisor. Performed evaluations of DSM programs; represented the utility in the DSM Collaborative Process through the Measurement Subcommittee. Principal contributor to the DSM Measurement and Evaluation Protocols.

1987-1990, Marketing Information Supervisor. Performed qualitative and quantitative marketing information in the commercial/industrial and residential sectors.

1985-1987, Research and Analysis Program Supervisor. Organized, staffed, and supervised the Research and Analysis section of Gas Marketing.

1984-1985, Alternative Energy Analyst. Planned and performed analyses for energy related studies, including benefit-cost studies and contribution to system load studies.

1982-1984, Load Management Analyst. Analyzed results of experimental Load Management projects and various special requests by the Customer Energy Management Department and other departments.

University of California, San Diego, 1975-1981
Staff Research Associate, Department of Biology and Department of Chemistry. Supervised staff personnel involved in the operation of a biology and chemistry research laboratory.

FIELDS OF SPECIAL COMPETENCE

- Market Analyses and Assessment
- Program Design
- Data and Systems Management
- Program Monitoring and Evaluation
- Market Research
- Load Research
- Project Management

- Development of Measurement Protocol
- Program Strategy Development

MAJOR PROJECTS: PROGRAM DESIGN AND IMPLEMENTATION

Federal Government Facilities. Managing audit program of Federal Government facilities, including military bases. Program comprised of conducting detailed audits of facilities and completing audit forms, including developing retrofit recommendations that provide energy savings and performing data entry and processing tasks necessary for direct electronic uploading of data into the San Diego Gas & Electric program tracking system.

Managing on-site monitoring project of major buildings at a large university. Project consists of site assessment, monitoring plan development, procurement of equipment, installation, and data collection and management.

San Diego Gas & Electric (SDG&E). Managed a commercial short-term monitoring project is comprised of an on-site inspection of commercial DSM program participants, development of a metering plan, installation, data management, analysis, and reporting.

San Diego Gas & Electric. Managed residential in-home audit program for SDG&E. Staff included twelve auditors. Functions included staffing, training, procurement of vehicles, establishment of procedures, tracking, and analysis.

San Diego Gas & Electric. Managed direct assistance saturation survey for SDG&E comprised of an on-site audit and associated analysis and reporting. Functions included targeting, scheduling, quality control, and database management.

Southern California Edison (SCE). Directing residential mail-in audit program for SCE. Program consists of the solicitation, data collection, and analysis of mail-out and mail-in questionnaires to produce a detailed end-use audit report that is returned to the customer. Approximately 10,000 customers will be processed in 1992.

San Diego Gas & Electric. Directing residential mail-in audit program for SDG&E. Program consists of the solicitation, data collection, and analysis of mail-out and mail-in questionnaires to produce a detailed end-use audit report that is returned to the customer. Approximately 10,000 customers will be processed in 1992.

Pacific Gas & Electric Company (PG&E). Managed large-scale residential on-site survey for PG&E. This survey consistd of more than 2,000 on-site inspections of homes for appliance saturation, dwelling characteristics, and appliance usage behavior. The survey results were placed in a database.

MAJOR PROJECTS: DATA AND SYSTEMS MANAGEMENT

San Diego Gas & Electric. Assisted in the planning and design of the Governmental Data Collection System for SDG&E. Consulted with SDG&E's programmer/analysts and scoped out a system that would allow "seamless" data entry and uploading of data from XENERGY's office into SDG&E's program tracking system.

San Diego Gas & Electric. Planned and coordinated the development and implementation of a comprehensive project tracking and information system, the *Customer Generation Database*

System, a computer-based system that provides an interactive environment enabling SDG&E to monitor the performance of customers who are self-generating electricity. This project required extensive programming in SAS and SAS Macro.

San Diego Gas & Electric. Working with Information Systems to conceptualize and develope SDG&E's Aggregated Customer Information Systems (ACIS), formerly CIRS. ACIS enables the user to aggregate individual billing accounts to a customer or premise level and retain these relationships.

MAJOR PROJECTS: MARKET ANALYSIS AND ASSESSMENT

San Diego Gas & Electric. Managed residential on-site survey to assess the saturation of weatherization measures in SDG&E's low-income population. Project used an innovative cluster sample methodology to mitigate response bias.

San Diego Gas & Electric. Performed market assessment for SDG&E's low-income rate assistance program, which incorporated data from billing, saturation studies, and U.S. Census to estimate the size of the market eligible for the tariff.

Performed market assessment for an experimental interruptible rate for commercial/industrial customers.

San Diego Gas & Electric. Performed market assessment for SDG&E's Direct Weatherization Assistance Program, integrating billing, saturation data, U.S. Census data, and program data to estimate the size of the remaining market.

San Diego Gas & Electric. Assisted in the development of SDG&E's Account Executive program by identifying key market segments that would be served by a single Account Executive.

San Diego Gas & Electric. Managed the extensive secondary analysis of key commercial/industrial market segments such as health care, education, and water districts to provide SDG&E with a complete understanding of the key business factors within these segments.

MAJOR PROJECTS: PROGRAM EVALUATION

Pacific Gas & Electric. Served as lead analyst for the 1990-1993 Nonresidential Retrofit Measure Retention Study, for which energy efficient measures installed as part of PG&E's retrofit programs were surveyed on-site for retention. The causes and effects of measure retention were examined and estimates of measure retention were developed.

San Diego Gas & Electric. Conducting, on an ongoing basis, a monitoring study for SDG&E's Commercial Lighting Retrofit Program for which hours of operation were gathered through light loggers and fixture retention were verified through direct observation, as well as conducting spot measurements of lighting fixtures on a pre- and post-retrofit basis. Data were compiled into a database for analysis.

Los Angeles Department of Water and Power. Managed the impact evaluation of LADWP's "A Better Idea" Program, a residential direct-installation program. The multi-pronged evaluation was comprised of on-site data collection (monitoring and audits), billing analysis, and engineering analysis.

San Diego Gas & Electric. Developed evaluation plans for SDG&E's Nonresidential DSM Programs. Project was comprised of reviewing program implementation process, program tracking systems and processing, and program files. Developed plans for each program based on findings of the assessment phase, including assessing first year impacts, persistence, both retention and performance over time, and data management.

San Diego Gas & Electric. Developed SDG&E's DSM Collaborate Measurement Plan including evaluation elements for load impact, cost refinement, and program process assessment.
San Diego Gas & Electric. Analyzed the load impact and customer satisfaction of SDG&E's direct load control program R*esidential PEAKSHIFT Project*. Assessed impact by incentive levels, cycling strategies, dwelling types, and customer demographics.

San Diego Gas & Electric. Conducted cost effectiveness analyses on QF's to determine their impact on SDG&E's system.

San Diego Gas & Electric. Managed the ongoing evaluation of SDG&E's Account Executive program, which requires the administration of mail surveys on a trimester basis.

MAJOR PROJECTS: MARKET RESEARCH

Los Angeles Department of Water and Power. Co-managed the Residential Competitive Positioning Study for the LADWP. This study was comprised of gathering residential customer attitudes and opinions of a variety of utility attributes, products, and services; how the client utility performed; and how the customers valued them. An action framework was then developed in which actions the utility may take to shape their competitiveness in the residential market were reviewed.

San Diego Gas & Electric. Analyzed commercial sector data and developed final database and report for SDG&E's 1992 Commercial Energy Use Survey. This project was comprised of taking data from disparate data sources, analyzing them and developing a framework for aggregating them to represent the commercial sector.

San Diego Gas & Electric. Managed the conduct of SDG&E's biennial residential appliance saturation study, *MIRACLE*, and its biennial Commercial Energy Use Study. Both studies incorporate a combination of mail, telephone, and on-site survey methods.

San Diego Gas & Electric. Planned, developed, and managed the conduct of SDG&E's *Providing Value to Small Commercial Customers Study*. The study methodology included focus groups, in-person interviews, and trade-off analyses to identify program elements valued by small commercial customers.

PROFESSIONAL AFFILIATIONS

Association of Demand-Side Management Professionals, 1989 to present
Electric Power Research Institute, Customer Preference and Behavior Project Advisory Group, 1987 to 1990
American Gas Association, Market Research and Market Planning Committee, 1986 to 1990
Pacific Coast Gas Association, 1988 to 1993

KARIN CORFEE

EDUCATION

Stanford University, M.S. in Civil Engineering: Energy and Environmental Planning, 1985
University of California at Berkeley, B.S. Political Economy of Natural Resources: Energy Resources, 1982

EXPERIENCE HIGHLIGHTS

XENERGY Inc., Oakland, California, 1998-Present
Senior Consultant. Performs a variety of quantitative and qualitative research in the areas of energy policy, energy-efficiency, market assessment and market transformation, program evaluation, performance measurement and Internet business strategies. Responsibilities include: project management, program administration, survey design and implementation, data collection, quantitative and qualitative data analysis, market research, analysis of emerging retail markets, regulatory analysis, and marketing.

Fru-Con Corporation, California, 1991-1995
Business Development Manager, West Coast.. Pursued engineering and construction opportunities in the energy and recycling market for Fru-Con in the western United States. Responsibilities included marketing, regulatory analysis, financial analysis and strategic planning. Established and maintained business relationships with independent power producers and utilities. Coordinated the strategic planning effort for entry into the Mexican market.

Fru-Con Corporation, St. Louis, Missouri, 1990-1991
Energy Planning Engineer. Project management support on ethanol and cogeneration facility in Sacramento, California. Responsibilities included business development in the energy and solid waste industries throughout the United States. Developed financial proformas and other analytical tools to evaluate the economics of cogeneration and independent power development opportunities. Chairperson of the Clean Air Act Task Force that analyzed the legislation, identified business opportunities and trained clients on compliance requirements.

Union Electric Company, St. Louis, Missouri, 1989-1990
Engineer, Corporate Planning Department.. Prepared commercial end-use forecasts and system peak demand forecasts. Developed Integrated Resource Plan. Provided analytical support for demand-side planning activities, regulatory proceedings and the budget process. Formal presentations to Union Electric's Board of Directors, EPRI and customers.

City of Palo Alto, Palo Alto, California, 1985-1988
Associate Power Engineer, Resource Planning. Forecasted City's electric, gas and water requirements. Developed improved short-term and long-term forecasting models. Preparation of the Electric, Gas and Water Resource Plans. Demand-side planning and analysis. Prepared utility financial projections. Reviewed and documented generation planning and production costing computer models. Developed and coordinated end-use survey of commercial customers.

Pacific Gas and Electric Company, Oakland, California, 1983-1984
Conservation Analyst. Budget coordinator for the District's Energy Management Program. Organized and monitored educational services to promote energy conservation in the public schools. Special project: Decentralization Follow-up Report.

Pacific Gas and Electric Company, Oakland, California, 1982-1983
Conservation Representative. Performed energy audits on commercial and industrial buildings. Small Commercial Audit Program (SCAP) Coordinator. School District's Energy Conservation Representative. Special project: 1984 Energy Management Marketing Plan.

Lawrence Berkeley Laboratories, Berkeley, California, 1978
Technical Research Analyst. Calculated and compiled data regarding energy efficiency of home appliances. Full time temporary position.

FIELDS OF SPECIAL COMPETENCE

- Strategic planning
- Resource planning
- Energy Efficiency program design and evaluation
- Market research and analysis
- Indicator Development and Performance Measurement
- Survey Design and Implementation
- Business Development
- Multivariate Statistical Analysis
- Engineering economics (cost/benefit, decision analysis, etc.)

MAJOR PROJECTS—XENERGY

Internet Strategies 2000. Multi-Client Study. This study involved reviews of the web sites of 80 energy companies, surveys of the Internet strategies of more than 20 energy companies, and surveys of more than 600 residential and business Internet users.

PTCS Venture Market Baseline Report. Northwest Energy Efficiency Alliance. This study conducted baseline market research for the Northwest Energy Efficiency Alliance for the purpose of supporting the evaluation of the Performance Tested Comfort Systems Venture. Baseline data was developed for both consumers and contractors on issues pertaining to HVAC, duct and watherization services. Additionally, the study developed the initial program theories and hypotheses that could be used as the foundation for the evaluation efforts.

Customer Care Services Study. Roseville Electric. This study examined the customer service offerings and performance of the City of Roseville and Roseville Electric. We interviewed key staff responsible for various aspects of customer service, reviewed processes and systems that support these services, assessed call center volume and customer demand for services, and interviewed other utilities for the purpose of benchmarking service performance and offerings. The study presents the results and recommendations from this research.

Duct Efficiency Market Progress Report. Northwest Energy Efficiency Alliance. This study involved interviewing 23 utilities that participated in the Residential Duct System Venture to document their activities with the program and assess market transformation.

State Briefs on Restructuring Activities. Multi-Client Studies. Regulatory and market analysis of electric market restructuring activities in Texas, Arizona and New Mexico.

California Baseline Data Study. California Board for Energy Efficiency and San Diego Gas and Electric Company.

1997- Industrial Energy Efficiency Incentive Program Impact Evaluation. Pacific Gas & Electric Company.

Evaluation of Pacific Power's Direct Access and Portfolio Pilot Programs. Pacific Power.

Measurement and Evaluation of Hawaiian Electric Company's DSM Programs. Hawaiian Electric Company.

VALY T. GOEPFRICH, PH.D.

EDUCATION

Ph.D. Economics, University of Wisconsin—Madison, 1996
- Major field: Industrial Organization and Applied Microeconomics.
- Minor field: Econometrics and Advanced Theory/Mathematical Economics.

M.S. Economics, University of Wisconsin–Madison

B.A. Economics, Fairfield University, Fairfield, Connecticut

EXPERIENCE HIGHLIGHTS

XENERGY Inc., Madison, Wisconsin, 1997–Present
Econometrician. Project experience includes: program evaluations, baseline studies, retention studies, residential appliance saturation surveys, and load data analysis. Primary responsibility is to conduct or direct the data analysis. Also involved in sample design, design of data collection instruments, and report writing.

University of Wisconsin–Madison, Department of Economics, January 1997–May 1997
Lecturer. Taught two courses.
- The Economics of Health Care, an undergraduate and a graduate course; and Principles of Economics–Accelerated Treatment, an undergraduate course.
- Received an above average rating from the students as an instructor.

University of Wisconsin–La Crosse, Department of Economics, August 1991–May 1994
Assistant Professor. Primary responsibility teaching undergraduates, followed by research, then service.
- Taught a variety of courses, including Industrial Organization, Business and Economics Research and Communication.
- Wrote a research proposal that was selected for funding by the University.
- Managed and supervised the Department's staff of tutors and chaired the Department's scholarship committee.

University of Wisconsin–Madison, Department of Economics, August 1987–August 1988
Health Economics Trainee.
- Surveyed the health economics literature.
- Conducted research in the field of health economics both independently and jointly with Burton Weisbrod. The joint research resulted in a publication.

MAJOR PROJECTS

Retention Studies

- **Pacific Gas & Electric Company**: (1) Retention Study of PG&E's Industrial Energy Efficiency Incentive Programs, Program Years 1994 and 1995; (2) Retention Study of PG&E's Industrial Energy Efficiency Incentive Programs,

Program Years 1996 and 1997; (3) Retention Study of PG&E's Appliance Energy Efficiency Programs, Program Years 1994 and 1995.

- ① Directed the analysis of these three studies. All three studies employed data collected approximately three years after installation, and the two studies for program years 1994 and 1995 also employed data collected approximately six years after installation.

- **Northeast Utilities Service Company**: Retention Study of NU's SPECTRUM Single-Family and Multi-Family Electric Heat Programs. As project manager, involved in all aspects of this study. Designed the samples. Primary author of the telephone questionnaire and on-site data collection materials. Oversaw the data collection, both telephone and on-site inspections. Directed the analysis. Data from program participants in all program years to date, 1990-2000, were employed in the analysis. 2001.

Program Evaluation

- **Northeast Utilities Service Company**: Evaluation of NU's SPECTRUM SmartLiving™ Catalog and Retail Lighting Programs. Designed the sample: a single on-site inspections sample and two telephone samples, one for each of the two programs. Helped to develop the methodology employed to estimate the gross impact of each of the programs and directed this analysis. The gross impact of lighting measures was estimated using a double combined ratio estimate and the gross impact of hot water measures was estimated using a simple combined ratio estimate. 2001.
- **U.S. Environmental Protection Agency (under subcontract to the Cadmus Group)**: Logistic Regression Analysis to Explore Factors that Contribute to ENERGY STAR® Label Awareness, Understanding, and Influence. Directed this analysis. 2001.
- **U.S. Environmental Protection Agency (under subcontract to the Cadmus Group)**: CEE ENERGY STAR® Household Survey Report (2000). A nationwide evaluation of the effects of the ENERGY STAR labeling program. Analyzed data obtained from a survey of customer recognition, understanding, and use of the ENERGY STAR label in purchasing decisions. Several distinct samples were surveyed. Provided point estimates of the combined survey data employing sample weights and standard errors of the estimates consistent with the sample designs. For each survey variable, in addition to an overall estimate and standard error, results were generated by various household characteristics (e.g., publicity category, understanding of ENERGY STAR label, number of persons in household). Conducted statistical tests of the difference between selected means and proportions. Investigated the consequences of survey non-response. 2001.
- **California Board of Energy Efficiency, sponsor, and Pacific Gas & Electric Company, manager**: Development of New Methods for Forecasting & Estimation of Benefits from Market Effects. In this study, several Measurement and Evaluation experts, including Miriam Goldberg of XENERGY Inc., developed "A Framework for Planning and Assessing Publicly Funded Energy Efficiency." Worked extensively with Dr. Goldberg to develop the policy framework that served as the foundation for this study. 2001.

  Pacific Gas & Electric Company: First Year Load Impact Evaluation of PG&E's 1997 Residential Energy Management Services. Responsible for all aspects of the multifamily property component of this study: primary data collection, analysis, and the report. The

analysis consisted of a billing analysis and survey data were analyzed to determine the take rate and the net-to-gross ratio.

FRANK L. POWELL, P.E.

EDUCATION

1972: Master of Engineering; Cornell University
1971: BS Engineering (Mechanical major), Cornell University

EXPERIENCE HIGHLIGHTS

XENERGY Inc., Oakland, California, 1993-Present
Senior Engineer. Responsible for providing technical analysis of complex energy technologies in both commercial and industrial applications. Has direct responsibility of supervision of engineering staff on facility energy analysis and DSM projects throughout the Western Region. Prepare customized rebate projects for utility review and customer proposals. Expertise in process-related work in a multitude of industrial end uses. Performed industrial fuel consumption and competitive fuel cost analysis (typically oil vs. electricity) in Zambia. As a technical advisor for the United Nations, performed energy audits in the industries of dairy products, paper processing, glass melting and shaping, brewing, dynamite production, food processing, and cement. Performed related work for the Government of Barbados through the World Bank, primarily in the commercial facilities. In addition to numerous commercial buildings and hotel and restaurant properties, reviewed energy use and competitive fuel issues in laundry, flour mill, sugar refining, pharmaceuticals, pasta production, and other industrial food processing industries. Investigated the use of natural-gas-driven domestic water pumping as part of a national electrical peak-load management strategy. Designed forms for field data collection and used a Paradox-based management tool to manage scheduling and personnel resources.

11/87-8/93: Director of Engineering; National Energy Management Institute, Alexandria VA
Responsible for developing and directing all technical aspects of energy management and indoor air quality projects for national construction-trade supported organization.

- Prepared strategic plan; Developed and presented program and project budgets;
- Developed indoor air quality program;
- Wrote and managed preparation of energy and indoor air quality technical manuals; Developed energy and indoor air quality analytical software.
- Performed site visits and analyses of energy and indoor air quality in several large commercial facilities.
- Developed preliminary designs for several energy performance projects.
- Developed energy analysis and monitoring strategies and software for energy performance projects.
- Negotiated guaranteed energy savings insurance policy with national insurer.

2/86-11/87: Program Manager and local representative; Xenergy, Inc. Washington DC.

- Managed tasks supporting middle Atlantic office of energy consulting firm; Performed and managed demand management programs for Potomac Electric Power Co.; Consolidated Edison Co., Commonwealth Electric Co; and several other utilities.
- Conducted Technical Assistance Project in Zambia for the United Nations Development Program: Specified and procured energy monitoring equipment; trained local engineers, performed energy audits of large industrial facilities including glass, copper, dynamite, dairy vegetable products and paper processing plants.

5/83-2/86: Project Engineer; Technical Task Manager: Quest/DHR, Inc.; Roslyn, VA
Technical Assistance Project for the Government of Barbados, World Bank Project
Directed all technical program activities, including:

- Trained and managed local staff of four engineers/technicians.
- Performed energy audits of 40 industrial and commercial facilities;
- Prepared curriculum and taught courses in energy technology and energy management.
- Wrote and directed staff in producing energy conservation manuals for industrial, hotel, commercial and institutional sectors.
- Wrote manual for energy saving design in tropical climates and presented technical information to engineering and architecture organizations.
- Prepared successful Cabinet proposals for implementing energy projects at government facilities.
- Performed detailed review of energy use and conservation opportunities at the Barbados Water Authority.
- **Caribbean Development Bank:** Performed energy conservation potential study of 8 major tourist resorts for the British Virgin Islands Electric Utility.
- **USDOE:** Prepared original primer on performance contracting within the Federal Government; Conducted industry research and developed 10 year projections for improved efficiency of packaged air conditioners.

4/79-5/83 Senior Engineer/Project Manager, Xenergy, Inc., Burlington, MA

- Conducted and managed facility energy studies for a variety of industrial, commercial and institutional facilities in Northeast US including schools, electronics fabrication, and recreational facilities;
- Developed engineering algorithms, data forms, report text, and training materials for XenCAP computerized energy audit software. Acted as customer service engineer for introduction of XENCAP to major utility licensees.

State of Vermont Government: 5/73-4/79
Conservation Director: Vermont State Energy Office 8/76-4/79
Initial conservation engineer for newly created State Energy Office;

- Developed overall conservation program plan and budgets.
- Prepared technical training and promotional materials; carried out energy audits of major State facilities including prisons, colleges and office buildings.
- Prepared the State of Vermont's application and developed program implementation plan for the "Institutional Conservation Program"-funded energy audits and energy projects.

Facilities Engineer: State Environmental Agency and Division of State Buildings
Responsible for design and construction management for a variety of civil and small capital improvement and deferred maintenance projects involving buildings, roads, water supply, waste disposal and other public works.

- Managed four person survey/technician team.
- Designed water supply, treatment and distribution and wastewater treatment systems for State Park facilities

MAJOR PROJECTS

INTERNATIONAL ENERGY CONSULTING, PROJECT MANAGEMENT AND ADVISORY WORK

Technical Director: World Bank Energy Assistance Program, Barbados. (5/83-5/87)
The purpose of this project was to reduce oil imports - a major drain on the Barbadian economy Major tasks carried out included

1. Energy audits and reports presented for more than 40 facilities including hospitals, airport, retail stores, hotels, schools and industrial plants; trained two local assistants in energy analysis techniques.
2. Conducted a detailed energy audit of the Barbados Water Authority. Measures evaluated included power factor correction, improved pumping control and storage, engine driven pumps at selected locations, motor and transformer efficiency, wind energy supply, and reduction of leakage losses and pressure drop.
3. Wrote and distributed energy conservation manuals for industrial, commercial institutional and hotel sectors;
4. Prepared curriculum and materials and presented two forty-hour courses for facility engineers and executives on energy conservation principles, practices and economic evaluation of energy projects.
5. Prepared cabinet proposals for $1million improvements for the international airport.
6. Wrote manual: Design Guidelines for Energy -Efficient Construction in Barbados; presented to engineering and architectural groups.

Technical Assistance Support Expert, Zambia Office of Energy; for United Nations Development Program (UNDP) (10/86-4/87)
Training and technology transfer project.

- Specified and purchased a large quantity of energy measurement equipment for Zambia Energy unit.
- Lead a team of three local engineering staff in performing and presenting energy audits of 12 large industrial plants. Facilities included glass, brewery, dairy, explosive, copper, vegetable products, and paper-processing plants.
- Planned and developed materials for two energy seminars presented to plant engineers and managers. Materials were based on the results of the industrial energy audits.
- Developed inventory of major industrial oil-burning equipment;
- Performed preliminary feasibility analysis of fuel-substitution (electricity for oil) in some industrial power applications.

Energy Audit Expert; USAID Energy Project: Cairo, Egypt. (7/96-9/96)
This portion of the large energy conservation project was intended to:

- Train and transfer technology to two local energy agencies and
- To instruct local electric utility representatives in demand management and technical support for customers.
- The project involved performing energy use surveys and preparing preliminary energy audit reports for 13 major industrial plants. Facilities included textile (spinning/weaving/finishing) mills; foundries (induction melting and spin and sand mold casting) , steel refining (arc furnaces); ceramic tile, plastic (thermoforming and injection molding); and cement plants. All audits were carried out to train local staff in field observation, analysis techniques and presentation skills.

Technical Adviser; Caribbean Development Bank Energy Project, British Virgin Islands (12/86).
Led team conducting energy audits of eight resort hotels in three week period. Performed site visits, conducted spot measurements, and prepared summary reports with investment analysis for each facility.

UTILITY INCENTIVE PROGRAM MEASUREMENT AND EVALUATION

In this area, Mr. Powell provides technical services to electric utilities that must provide post-project measurement and evaluation of actual results of ratepayer-supported incentive programs. These evaluations involve selecting a representative sample of sites for detailed review and analysis of project performance. Typically these projects were carried out in association with a team of economists, statisticians and engineers. Mr. Powell managed and conducted the site-specific evaluation tasks of the evaluation project. The evaluations involve review of program records, advising the statistics group on segmentation and sample selection, development of site- and technology-specific evaluation approach and methodology. The evaluations also included review of project files, assessment of analytical methods used; developing the site evaluation strategy, selection of models, monitoring or other analytical approaches; carrying out site visits including operating data collection and placement of monitoring equipment, energy savings analysis, and preparation of site-specific reports. Evaluation projects (all carried out in association with Xenergy, Inc., Oakland, CA) included:

***Pacific Gas and Electric Company*: Industrial Energy Rebate Program: 1997/98 &1998/99 Commercial "Process" Energy Rebate Program: 1998**
This program addressed energy and electrical demand reduction at industrial and commercial process facilities. Work detailed review of 38 major industrial process improvement projects which received incentives through the PG&E C and I DSM Program. Projects included air compressors, water and oil well pumps, quarrying and materials handling equipment, adjustable speed drives on fans in lumber and metal processing plants and process water chillers.

***San Diego Gas and Electric Co.* - Industrial Process Program: 1996 and 1997**
Performed post-project review of 29 major process efficiency projects which received SDG&E incentives. Evaluation involved file review, on-site measurements and monitoring, interviews with operating personnel and decision-makers; engineering analysis using monitoring results and net-to-gross analysis. Prepared detailed site reports and assisted in writing overall evaluation report. Projects involved air compressor plants, adjustable speed fan and pump drives and injection molding.

***Hawaiian Electric Company* - Commercial Process and HVAC Project Evaluations: 1996/97 & 1998/99**
Performed post-project review of 64 major HVAC efficiency projects at 26 sites which received HECO incentives. Evaluation involved file review, on-site measurements and monitoring, interviews with operating personnel and decision-makers; engineering analysis using monitoring results and net-to-gross analysis. Prepared detailed site reports and assisted in writing overall program evaluation report.

***Pacific Gas and Electric Company*: Industrial HVAC Program: 1993/94**
This project involved on-site evaluations of 30 industrial and commercial facilities. Developed technology and process-specific models were developed for 12 sites, and managed a team developing DOE models for 12 sites. . (Project carried out in association with Xenergy, Inc.)

***Pacific Gas and Electric Company*: Industrial Program: 1993/94**
This program addressed energy and electrical demand reduction at industrial process facilities. Work involved carrying out site evaluations and analyses as well as management and review of work by four specialty engineering analyst/consultants. (Project carried out in association with Xenergy, Inc.)

***Portland General Electric Company*: Electronics Industry and Adjustable Speed Drive Program Evaluation 1993/1994**
This project involved monitoring ASD's installed at several industrial applications and detailed analysis of ASD, chiller improvements and lighting improvements at several facilities owned by a single electronics manufacturer. Limited access to the sites demanded an organized and efficient site review and measurement effort with minimal impact on customer operations and staff time. The evaluation results were well received by utility and regulatory representatives. (Project carried out in association with Xenergy, Inc.)

Portland General Electric Company: Industrial Energy Efficiency Programs Evaluation 1994/1995, 1996/1997, 1998/1999
Managed site evaluations at 75 facilities at which 35 were carried out personally. Technologies evaluated included ASD's, air compressors, industrial refrigeration plants, process HVAC, a number of "whole-plant" modifications including lighting, controls, fan and pump modifications, and several unique process improvements including thermoforming, communications and electronics manufacturing. Monitoring was carried out at 10 facilities. (Project carried out in association with Xenergy, Inc.)

Portland General Electric Company: 1994/1995 Commercial Energy Efficiency Program
This project evaluated lighting and HVAC projects at commercial sites. Projects generally involved data gathering by on-site equipment. Analysis involved technology or end-use specific models based on site observations. (Project carried out in association with Xenergy, Inc.)

COMMERCIAL AND INDUSTRIAL ENERGY AUDITS:

Through 21 years, Mr. Powell carried out or directed detailed energy audits of a wide variety of facilities. Most reports included a review of energy use records, detailed site investigations, spot or short-term energy use measurements, overall energy use and cost analyses, end-use and efficiency analyses using technology-specific or whole-building models, identification of specific energy cost-saving measures, energy savings and cost estimations, financial evaluations (including life-cycle-costing), report preparation and customer presentation. Example sites are listed below by type of facility.

Institutional

The Grantley Adams International Airport, Barbados
Queens Hospital, Barbados
St. Joseph's Hospital, Barbados
Dartmouth University - Dining & Kitchen Facility, Hanover NH
Norwich Elementary School, Norwich VT
Norwich University, VT
Castleton State College, VT
Johnson State College, VT
Vermont Technical College, VT
The Cambridge School - Concord, MA
The Boys Clubs of New York and New Jersey: 22 sites
Dedham Public Schools, MA
Barbados Inst. Of Management and Planning
The University of the West Indies, Barbados

Commercial Facilities

DaCosta's Department Store, Barbados.
Barclays' Bank Ltd., Barbados
Nemwil Insurance Co, Barbados
Goddards Department Store, Barbados
Marine House (Customs), Barbados

Government

Shasta County Justice Facility
Hollister, CA - 9 Municipal Buildings
The National Insurance Building, Barbados
National Treasury Building, Barbados
Barbados Inst. Of Mgmt. And Planning
The National Stadium, Barbados
The National Petroleum Building, Barbados
Government Analyst Labs, Barbados

Industrial Facilities

Digital Equipment Corporation, MA
Kapiri Glass Company, Zambia
Kafue Explosive Plant, Zambia
Lusaka Dairy, Zambia
Lusaka Vegetable Products, Zambia
Pine Hill Dairy, Barbados
Bayer Pharmaceuticals, Barbados
Playtex, Ltd., Barbados
Windmill Food Products, Barbados
Barbados Flour Mills Cavalier Industries (Pasta), Barbados
Roberts Food and Grain Products, Barbados
Banks Breweries, Ltd., Barbados
Acme Metal Products, Barbados
Barpac Meat Products, Barbados

Hotel/Resort Properties

Hilton Hotel, Barbados
Sandy Beach Hotel, Barbados
Coral Reef Club, Barbados
Marriott Hotel, Barbados
Royal Palm Hotel, Barbados
Rockley Resort Hotel, Barbados
Welcome Inn, Barbados
Sandy Lane Hotel, Barbados
Sandpiper Hotel, Barbados
Settlers Beach Hotel, Barbados
Windsor Arms Hotel, Barbados
Coral Reef Club, British Virgin Islands
Tradewinds Resort, BVI
Biras Creek Hotel, BVI
Little Dix Bay Resort, BVI
The Moorings, BVI

SOFTWARE PRODUCT DEVELOPMENT AND PRODUCT MANAGEMENT

XenCAP ™ Computer Generated Energy Audit Software

As part of a 6 month team effort, Mr. Powell developed the analytical algorithms and conditional text for a computer-based energy audit software, called XenCAP . He also designed the original data entry forms, wrote the initial training and documentation manual and carried out training programs for internal staff and licensee users.. He also acted as product manager during the introduction to the first licensees Customers included: Northeast Utilities Company, Potomac Edison Company, Detroit Edison Company, Pacific Gas and Electric Company and MASS SAVE.

Process and HVAC Equipment-Performance Analysis Software

As part of energy audits and project evaluations, a number of software models and tools were developed using a spreadsheet-applications format. (In addition, field data collection instruments were developed to support site data collection for most of these items.) Some examples include:

- Overall building and facility energy use and cost
- Energy end use and system consumption breakdown (demand, energy and fuels)
- Lighting system improvement assessment
- Adjustable speed drive assessment (for industrial process motors and HVAC fans and pumps)
- Cooling tower performance assessment
- Chiller performance analysis
- Air compressor systems improvement analysis
- Energy and demand savings impact of process and HVAC equipment efficiency improvements under time-of-use and seasonal electricity rates
- Fuel substitution analysis
- Cogeneration project analysis
- Thermal energy storage feasibility assessment
- Life-cycle cost analysis
- Project financing analysis and cash-flow presentations
- Energy performance project monitoring, evaluation and savings documentation

REPORTS, PUBLICATIONS, AND PRESENTATIONS

In addition to site-specific energy audit reports, Mr. Powell is the author of several technical papers, reports and other publications, including:

Mowris, R., Powell, F., Impact Evaluation of Pacific Gas & Electric Company's Industrial HVAC Programs, Proceedings ACEE 1996 Meeting, August, 1996.

Clarke, L., Coito, F., Powell, F. Impact Evaluation of Pacific Gas & Electric's Industrial Process Refrigeration and Miscellaneous Measures Programs, ACEE 1996 Meeting, August, 1996.

Present and Projected Efficiency Improvements in Central Air Conditioners and Heat Pumps: 1985-1992. Research Report for USDOE Building Equipment Division, November, 1994

Energy Conservation Products and Technology Evaluation; Task Report for International Bank for Reconstruction and Development (IBRD) Energy Assistance Program, Barbados West Indies, April, 1985.

Energy Use and Conservation Potential, Barbados Water Authority: Analysis and Report: IBRD Energy Assistance Project, Barbados West Indies, March, 1985.

Standards and Guidelines for Energy Conservation in the Design and Construction of New or Substantially Renovated Buildings, Task Document, IBRD Energy Assistance Program, Barbados West Indies, March, 1994.

Energy Conservation Potential in Barbados: Summary of the results and findings from the energy audit task, (with D. Staples)IBRD Technical Assistance Project, Barbados West Indies, March, 1994.

How to Reduce Energy Costs in Commercial Facilities, Manual for Owners and Managers; IBRD Technical Assistance Project, Barbados West Indies, August, 1994.

How to Reduce Energy Costs in Industrial Facilities, Manual for Owners and Managers; IBRD Technical Assistance Project, Barbados West Indies, August, 1994.

How to Reduce Energy Costs in Hotel Facilities, Manual for Owners and Managers; IBRD Technical Assistance Project, Barbados West Indies, August, 1994.

Final Report: IBRD Technical Assistance Energy Conservation Project, Year 1: Summary of the results and findings of the first project year, (with D. Staples)IBRD Technical Assistance Project, Barbados West Indies, April, 1994.

Final Report: IBRD Technical Assistance Energy Conservation Project: Summary of the results and findings of the Project, (with D. Staples)IBRD Technical Assistance Project, Barbados West Indies, April, 1995.

National Energy Management Institute: 5 Year Strategic Plan, National Energy management Institute, Alexandria, VA, 1991

Indoor Air Quality Training Manual, National Energy Management Institute, Alexandria, VA, March 1990.

Indoor Air Quality Training Program for HVAC Technicians, National Energy Management Institute, March 1991.

Indoor Air Quality Training Program for HVAC Contractors, National Energy Management Institute, March 1990.

Prepared and delivered keynote address for the Barbados National Energy Seminar attended by 200 facility executives and managers;

Prepared and delivered technical session “Energy Management in Industrial Facilities” as part of Zambia Industrial energy conservation promotion and training program;

Appeared on National Financial Television Service and local and national radio stations discussing Indoor Air Quality as part of national industry promotion effort.

Invited speaker to ASHRAE, Association of Energy Engineers, Association of Professional Energy Managers on indoor air quality and energy conservation

Prepared and delivered presentations on IAQ and energy management to Associated Air Balance Council, National Environmental Balancing Bureau, and Sheet Metal and Air Conditioning National Association national meetings.

Appeared on indoor air quality panel of experts at National Restaurant Association meeting, April, 2001 Chicago, Illinois.

EXPERT TESTIMONY

Prepared written testimony and testified before the House subcommittee on Natural Resources and Environment of the House Industry and Commerce on proposed indoor air quality legislation;

Testified before a number of local and state committees on proposed IAQ rules or programs;

Edited testimony for National Energy Management Institute for 2001 for US Senate Energy Committee hearings on 2001 Energy Legislation.

TRAINING

Prepared materials and delivered a series (12) of 8-hour training seminars on Indoor Air Quality for HVAC contractors;

Prepared materials and delivered two - 40-hour IAQ instructors training programs for HVAC technicians;

Prepared materials and conducted 40-hour course: “Energy Analysis and Management for Facility Engineers and Managers’; Barbados Institute of Management and Productivity;

Prepared materials and carried out 32 hour course: “Energy Cost Management Owners and Directors; Barbados Institute of Management and Productivity;

Training Seminar for Egyptian Electricity Customer Service and Engineering staff: “Analysis of Energy use and Conservation Opportunities for Industrial Facilities in Egypt’;

Organized and conducted 8-80 hour training sessions for using energy audit report software for utility energy-efficiency program staff;

Developed and taught course in HVAC systems for International Facility Managers Association

PROFESSIONAL AFFILIATIONS

Professional Registration: California: (Mechanical); Massachusetts: (Civil); New Hampshire: (Civil/HVAC); Vermont: (Civil/Sanitary).

THOMAS S. MICHELMAN

EDUCATION

M.S., Resource Economics, University of Rhode Island, (Thesis, *Contingent Valuation and the Bounded Rationality Perspective* winner of award of merit at AAAE and NAREA conferences)

B.A., Mathematical Methods in the Social Sciences/Political Science, Northwestern University.

EXPERIENCE HIGHLIGHTS

XENERGY Inc., Burlington, MA. Energy Consultant - Specializing in quantitative evaluation and market research. 1993 to Present.

University of Rhode Island, Kingston, RI. - Economic Research Assistant, 1989 to 1991.

National Perinatal Information Center, Providence, RI. - Consultant/Research Analyst, 1986 to 1990.

Putnam, Hayes and Bartlett, Cambridge, MA. - Manager/Network Administrator, 1985 to 1986.

FIELDS OF SPECIAL COMPETENCE

- Statistical Analysis
- Multivariate Modeling
- Market Research
- Survey Design and Implementation
- Load Research
- Program Evaluation

MAJOR PROJECTS

Lead analyst and manager of customer research task of Multi-Client retail wheeling pilot program. Immersed in "soup-to-nuts" creation, testing, implementation, analysis and reporting of four telephone and two mail surveys in a twelve week period. Analysis ranged from simple presentation of results in tabular and graphical format to multi-nomial logit modeling of customers' decision of supplier.

Managed evaluation of Eastern Utilities Associates Residential Efficient Lighting program. The core analysis utilized a stratified, mean-per-unit (MPU) estimate of energy savings at the lamp level. This methodology combined data from tracking systems, customer surveys, and lighting loggers to compute energy savings over three program years. Free-ridership and spillover estimate of savings were also computed.

Managed and analyzed evaluation of Cincinnati Gas & Electric's Thermal Energy Storage Program. Modeled hourly load via seemingly unrelated regression (SUR). Computed program impacts and estimated precision via Monte Carlo simulation.

For the DOE Motor Master program, was key to coding and executing a complicated sampling plan. The goal of the task was to draw a random a stratified sample that minimized the estimated

variance of motor energy usage for U.S. industrial customers. The pull of sample sites employed a three stage sampling plan.

Employed sophisticated econometric techniques to compute estimates of large A/C load for a cost-effective metering study. Annualized estimates of A/C load for different types and durations of metering were compared and contrasted. The different scenarios ranged from simple whole premise billing data to the "Gold Standard" of concurrent kW interval, Btu, temperature and humidity.

For Endesa analyzed the marginal cost to serve individual customer classes. The prerequisite for this analysis included characterizing annual hourly load shapes for all customer classes, and reconciling these estimates to the system load. Analysis focused upon cross-subsidization across customer classes and affiliates.

For Consolidated Edison of New York, managed, analyzed and computed effects of real-time pricing (RTP) program. Batch loadshapes were created for all participants, and these "pictures" were used as the basis of evidence of elasticity to price fluctuations for each customer. Savings were computed by comparing high price days with low price days of with comparable weather.

Managed a billing scenario analysis for 15 separate World Color plants, a large industrial printer. The main goals of this project were to research alternative billing rate structures that would result in cost savings for the client, and prepare engineers for on-site visits to the individual plants.

Employed cluster analysis to segment a small subset of Central Maine Power's residential customers using metered appliance end-use load data. Predicted clustered segments with a multinomial discrete choice model. Leveraged results to predict market segments for large portion of CMP's residential customers.

Lead analyst for ground-breaking project sponsored by five New England utilities that quantified spillover for residential lighting programs. Three methodologies and over 1,800 telephone survey responses of program participants, nonparticipants and nonprogram area customers were processed and used to estimate spillover effects. The methodologies were: comparison of saturation of CFLs; spillover estimates based on analysis of customer self-reports; and discrete choice modeling. A nested multinomial logit model was implemented as the discrete choice model. All three methodologies estimated comparable savings.

Estimated end-use EUIs of Dayton Power & Light's C&I segment for input into a COMPASS model. In step one data from over 4,000 on-site EAS energy audits were analyzed, validated and processed into site level estimates of energy usage by fuel type and end use. The second step defined and assigned weights by number of employees and SIC code for the DP&L service territory using Dun & Bradstreet data. In the last step the datasets were combined, and weighted EUIs were computed for the DP&L's service territory by building type.

Performed statistical analysis of customer billing data and telephone survey results for an evaluation of Boston Edison's Energy Fitness Program. Energy savings were estimated via a statistically adjusted engineering model with three end uses broken out. Total weighted program impacts and precision were calculated using multivariate regression techniques.

Investigated the change of energy use of Northeast Utilities single family electric heat residential customers using macroeconomic data. Exhibited through a seasonally adjusted X-11 forecasting model that residential energy use and economic conditions are highly correlated. Also investigated and found that an energy use model controlling for heating load, but not cooling load is mis-specified for this subset of customers.

For Consumers Power, analyzed billing, tracking, weather and survey data for four large residential DSM programs to compute program impacts. Integrated discrete choice model to adjust for self-selection and statistically adjusted engineering model to estimate specific measure impacts.

Statistically determined dispatchable and anticipatory impacts and coincidence factors of a commercial load management rates program for Northern States Power using hourly load research data from over 1,500 commercial/industrial customers. Integrated on-site survey results to quantify the magnitude of "embedded impacts"; those impacts that have become embedded in site operations and are no longer a function of day-to-day changes in rates.

Performed billing analyses for numerous electric and gas residential DSM programs, including large scale multi-measure, new construction, low-income and multi-fuels programs. Multivariate regression models, logit models for analyzing self-selection, and statistically adjusted engineering estimates of savings techniques have been used in these analyses. On sundry other projects, have implemented self-selection models to analyze commercial lighting programs and residential space heating choice.

PAPERS /PUBLICATIONS

Transforming Dusty, Self Selected Audit Data into Shiny New Population Estimates of Energy, T. Michelman, M. Goldberg, A. Loose. To be presented at the 1997 International Energy Program Evaluation Conference.

Gold or Gold Plated? Benefit-Cost Analyses of Differing Metering Methods and Durations, C. Quackenbush, T. Michelman, M. Goldberg, S. Manwell. To be presented at the 1997 International Energy Program Evaluation Conference.

Load-Based Customer Segmentation Using Hourly End-Use Data, T. Michelman and A. Parece. Presented at the 1996 Association of Edison Illuminating Companies (AEIC) Annual Load Research Conference.

Commercial and Industrial Customer Perceptions of Electric End-Use Consumption: A Comparison with Audit-Based Estimates, A. Parece and T. Michelman. Presented at the 1996 American Council for an Energy-Efficient Economy Summer Conference.

When Dual Cool is Cool: Validation and Evaluation of a Thermal Energy Storage Program, T. Michelman, T. Osterhus and A. Parece. Presented at the 1995 International Energy Program Evaluation Conference.

Contingent Valuation Methodology and the Bounded Rationality Perspectives, Master thesis, Department of Resource Economics, University of Rhode Island, 1992. Won

honorable mention at the American Association of Agricultural Economists and the Northeast Association of Agricultural Economists 1993 annual conferences

The Alternative Site Screening Process, J. Stachelhaus, A Maclachan, R. Duhaime and T. Michelman, Final Report for the Rhode Island Solid Waste Management Corporation.

Heterogeneous Preferences and Aggregation for Public Policy Assessment, A Landfill Citing Case, S. Swallow, T. Weaver, J. Opaluch and T. Michelman. .

Pediatric AIDS: Inpatient Costs, Patient Characteristics and Utilization, S. Allison-Cooke and T.S. Michelman, American Public Health Association Annual Meetings, Maternal & Child Health Section, Chicago, IL 1989.

The JCAHO Agenda for Change: An Evaluation of the Obstetric/Neonatal Indicators, S. Allison-Cooke, D.E. Gagnon and T.S. Michelman, American Public Health Association Annual Meetings, Health Administration Section, Chicago, IL 1989.

Cost and Utilization of Inpatient Service for Pediatric AIDS, S. Allison-Cooke and T.S. Michelman, National Center for Health Statistics, Conference on Records and Statistics, Washington, DC 1989.

DRG's and Their Impact on Perinatal Regionalization, R.M. Schwartz, D.E. Gagnon, J.H. Muri and T.S. Michelman, Final Report for the Office of Maternal and Child Health August 1989.

Estimating Parameters and Extent of Neonatal Infections for a National Population, S. Allison-Cooke and T.S. Michelman, Monograph for the Bristol Meyers Corp., 1988.

Predicting Resource Consumption Among Non-Normal Neonates: An Assessment of DRG's CDRG's and A Proposed Approach, R.M. Schwartz, T.S. Michelman, J. Pezzulo, and C. Phibbs, American Public Health Association Annual Meetings, Maternal & Child Health Section, Boston MA 1988.

The National Perinatal Data Base After Two Years, J.H. Muri and T.S. Michelman, American Public Health Association Annual Meetings, Statistical Section, Boston, MA 1988.

Levels of Care Revisited, R.M. Schwartz, S. Allison-Cooke, and T.S. Michelman, Robert Wood Johnson Foundation Conference on Regionalization of Perinatal Care, Newport, RI, 1988.

GEOF SYPHERS

EDUCATION

University of Massachusetts at Lowell, M.S. Energy Engineering, 1994
Sonoma State University, B.S. Physics, 1993
E.I.T. Certificate, State of California, 1996
LEED™ Accredited, 2002

EXPERIENCE HIGHLIGHTS

XENERGY Inc., Oakland, California, 1998-Present
Senior Engineer & Manager of Green Building Consulting. Mr. Syphers directs the Green Building Program at XENERGY which offers training courses, design assistance, code development and LEED™ documentation services. He provides new construction and major retrofit design assistance in the areas of siting, energy and water efficiency, daylighting, finishes, and community design. Recent project work involved facilitating several design charettes on large public projects and drafting a municipal green building ordinance. His project work also spans cost estimation, survey market research, database design and management of field crews.

Eley Associates, San Francisco, California, 1994-1998
Energy Engineer. Mr. Syphers was responsible for providing energy simulations with DOE2, Micropas, and VisualDOE, for performing site audits, market assessment studies, and cost research of DSM technologies, with special expertise in the areas of solar energy utilization and daylighting.

FIELDS OF SPECIAL COMPETENCE

- Green Building Design Assistance / Facilitated Charettes
- Public Speaking and Technical Training
- Building Energy Simulation

MAJOR PROJECTS

Green Building Design Assistance, Alameda County Waste Management Authority. Project Manager. Responsible for training government staff and design professionals in green building principles, implementation strategies and the LEED™ Rating System. Performed thirty project plan and specification reviews, providing targeted green building recommendations with cost estimates. Developed recommendations for a municipal green building ordinance.

Green Building Cost Estimating and Tailored LEED™ Project, City of San José. Project Manager. Estimated the cost of designing and building sixteen libraries to the LEED™ Certified standard. Drafted a local version of LEED™ San José incorporating references to local codes and requiring formerly optional green building practices that are now considered standard practice in the region.

Green Building Cost Analysis for Three City Buildings, City of Portland, OR. Engineer. Developed cost estimates for meeting the LEED 1.0 certified standard in a commerical office building, a police station and fire station in Portland. Used DOE2 models to analyze energy performance scenarios.

2001 DEER Update Study, California Energy Commission. Project Lead. Responsible for managing the day-to-day work involving cost collection, database design, cost model development and reporting for this study of commercial and residential energy efficiency measures in California. Nearly 9,000 cost points were collected and analyzed to produce recommended cost values for 1,100 measures from compact fluorescent lamps to variable speed drive controllers and air conditioning equipment.

ACT^2, Pacific Gas & Electric. Engineer. Responsible for calibrating one commercial and three residential DOE2 models with two years of 15-minute measured end-use data to estimate energy and demand savings. Modeling criteria were particularly stringent, requiring the creation of site-specific weather files from measured data, development of a new slab loss model for DOE2, use of an evaporative cooling algorithm, and development of a new whole-house fan model.

Business Energy Survey Tool, Pacific Gas & Electric. Project Manager. Responsible for reviewing the engineering assumptions in the existing survey tool used by PG&E representatives to estimate savings for a wide range of rebated measures. Later, the project expanded and responsibilities grew to include a complete overhaul of the program, written in VisualBasic for Applications.

Lighting Survey and Redesign, University of California at Davis. Project Manager and lead engineer on this lighting survey and complete retrofit of 14 campus buildings at UC Davis.

DSM Verification, Southern California Edison. Engineer. Responsible for paper review and site visit verification of SCE's 1995 and 1996 DSM nonresidential rebate programs. Efficient technologies covered by the program include fluorescent and HID lighting, variable-speed drives on HVAC fans, efficient chillers and pumps, high-performance windows, and lighting and HVAC controls. A sample of the larger rebates are simulated with DOE2 to verify reasonableness.

PG&E Residential New Construction Evaluation. Engineer. Development of VisualBasic 5 applications for data entry and for automatically generating Micropas computer simulation input files from survey data for 300 residences.

PG&E Industrial Rebate Program Evaluation. Engineer in charge of lighting evaluation. Oversight of fieldwork. Responsible for survey and database design, lighting savings analysis, and retention study.

New Construction Performance Contracting Pilot. Engineer. Responsible for writing the definitive guide to energy performance contracting in new buildings. The guide includes sample legal contracts between owners, architects and design-build companies.

Insulation Regression Study, Owens-Corning Fiberglas. Engineer. Responsible for designing a method to extend the capabilities of a software package used by Owens-Corning for calculating cost-effective levels of insulation. The change was needed to accommodate Owens-Corning's expansion into foreign markets, and allows for the adjustment of thermostat setpoints outside the typical range for the US. To accomplish this, a method of correlating loads with heating and cooling degree days for a number of building types was defined, and a regression performed on a set of over 5,000 building loads simulations.

RECENT PUBLICATIONS AND PRESENTATIONS

Lee, A.D., G. Syphers, A. Scott and T. Rasmussen. Green City Buildings: Applying the LEED Rating System, prepared for City of Portland Energy Office by XENERGY, Inc. and SERA Architects, June 2000.

Coito, F., G. Syphers., A. Lekov. and V. Richardson. Are Your Ducts All in a Row? Duct Efficiency Testing and Analysis for 150 New Homes, ACEEE v1, 1998.

Eley, C., G. Syphers and J. Stein. Contracting for New Building Energy Efficiency, ACEEE v3, 1998.

Syphers, G. Solar Energy, Sustainability and the Laws of Physics: An exploration into the meaning of Mass Conservation, *What Physicists Do* Lecture Series, 1998.

Syphers, G. The Fourth 'R', Discovering Resource Regeneration, *Sustainable San Francisco Quarterly*, January 1998.

Syphers, G., C. Eley. Energy Performance Contracting for New Buildings, prepared for the Energy Foundation by Eley Associates, 1997.

Syphers, G., J. Kennedy. The Cost of Sustainable Resource Consumption, *Solar Today*, August 1997.

Syphers, G. Closing the Loop - A Perspective On Sustainability, *Sustainable San Francisco Quarterly*, 1997.

Eley, C., G. Syphers. Performance Contracting for New Construction: Insuring Value From Your Investment, AIA/US Green Building Council Annual Meeting, Miami, 1997.

ERIK S. DYRR, C.E.M.

EDUCATION

California Polytechnic State University, San Luis Obispo, B.S. in Industrial Technology

EXPERIENCE HIGHLIGHTS

XENERGY Inc., Oakland, California, 1993-Present
Project Manager/Engineer. Projects have included management and engineering duties for various utility, government, industrial and commercial customer energy related projects. Responsible for performing energy audits, surveys, and engineering studies. In house technical lead for metering and monitoring activities including equipment specification and protocols. Manage data collection projects involving coordination of data collection for contracts with utilities throughout the country. Tasks include acting as technical lead for field staff, establishing field protocols, designing data collection forms, scheduling; hiring, training, directing of field staff, and technical review. Developer of electronic project scheduling and management tracking systems used for scheduling, tracking, client and auditor invoicing, and management reporting. Development of databases for analysis. Communicate and work with customers to refine details for the scope of work.

D & A Enterprises/Abedun Construction, Inc., Arroyo Grande, California, 1992
Residential and Commercial Construction. Performed estimating, bid processing, scheduling, and training and managing laborers. Projects ranged from flat work and foundations to spanned concrete bridges.

FIELDS OF SPECIAL COMPETENCE

- Industrial Energy Auditing;
- End-use metering and monitoring instrumentation and data acquisition hardware;
- End-use analysis of energy savings from lighting, HVAC, motors, and industrial process systems;
- Trained in the use of XenCAP™ and InSite™, automated commercial and industrial energy audit software programs used by major utilities and government agencies.

MAJOR PROJECTS

Innovative Peak Load Reduction Small Grants Program–California Energy Commission.
Lead Engineer. XENERGY is currently the program administrator for small grants under the California Energy Commission's Innovative Peak Load Reduction Program. With a $14 million budget, this statewide program offers small grants for projects that reduce peak electric demand. The program was launched on a fast track in response to the California energy crisis. Within a 1-month period, XENERGY was able to launch a mass marketing outreach campaign to solicit applications, create, and staff a call center for application support via web and telephone hotline, develop a tracking database to share with the CEC, and create a policies and procedures manual to guide program implementation. Lighting retrofits, HVAC and process improvements, peak load shifting, distributed generation utilizing waste-heat recovery and many other measures have been funded through the program. Responsible for all technical review of applications for grant funding. Performed review of complex measures proposed by applicants and supervised and provided quality control and technical assistance to junior engineers.

Measurement and Evaluation of Hawaiian Electric Company's 1996-1999 Demand Side Management Programs. Project Manager. Responsible for overall project management including: planning, set-up, and day-to-day operations for the evaluation of residential, commercial, and industrial DSM programs. Tasks include hiring, training, and supervision of employees, client communications, and engineering and measurement of program participant kW and kWh impacts. Evaluation methods include metering and monitoring, building simulations (DOE2.1), and standard engineering calculations. Facilities include resort hotels, multi-family residential, public and private offices, supermarkets, and retail facilities. Technologies include variable speed drives for HVAC fans, cooling towers, and chillers; high efficiency chillers and package AC units; oversized cooling towers, refrigeration system devices and controls, high-efficiency lighting and control systems.

Industrial Impact Evaluations:

- **Pacific Gas & Electric's 1998 Industrial Energy Efficiency Incentive Program;**
- **Pacific Gas & Electric's 1997/98 Commercial Energy Efficiency Program (Sub-Contractor for Commercial Process End Use including Air Compressor Sites and Wastewater Treatment Facilities);**
- **Pacific Gas & Electric's 1994 Industrial Process, Boiler, and Refrig. Measures;**
- **Portland General Electric's 1994-1995, 1996-1997, and 1998-1999 Commercial and Industrial Retrofit Programs;**
- **San Diego Gas & Electric's 1996 Industrial and Agricultural Energy Efficiency Incentives Programs;**

Site-by-site custom evaluation approaches were used to evaluate industrial energy efficiency projects. Coordinated between utility representatives, the customer, and XENERGY staff to evaluate the energy savings realized by the customer's projects. Determine defensible estimates of the gross and net impacts (kW, kWh, and therm) resulting from various industrial projects awarded incentives by utility's DSM programs. Individual site work included development of site-specific analysis techniques and field measurement strategies to assess energy savings of complex interactive industrial energy conservation measures. Identify any discrepancies between estimated and measured impacts; and suggest reasons for such discrepancies. The evaluation methods included file reviews, metering and monitoring, and re-engineering of the original savings impact estimates with the use of existing data sources including customer's facility management systems, manufacturer's equipment performance data, and billing data.

Energy Efficiency Studies: Synergy Semiconductors, City of Mountain View, City of Seaside and City of Roseville city owned facilities, Shasta County Jail. Identified and evaluated energy saving potential for various commercial and industrial facilities. Investigated motors, HVAC, compressed air systems, DHW, and lighting retrofit possibilities. Conducted site surveys, developed computer simulations, estimated project costs, and presented results and responded to customer requests for additional information..

Commercial End Use and Whole Building Load Research Project; Portland General Electric. Responsible for project planning and start-up activities. Designed data collection instrument to collect data for input to DOE2.1 building simulation modeling. Provided metering and monitoring guidence for end-use monitoring of 22 commercial facilities.

Commercial Air Conditioning Monitoring Project, Pacific Gas & Electric. Technical lead for commercial air conditioning metering and monitoring project. Involved development of long term metering plans to isolate air conditioning loads of PG&E's load research customers.

SAE Billing Analysis Project, British Columbia Hydro, Power Smart Program. Responsible for project management, technical/engineering review, survey design & pre-testing, hiring, training, quality control, etc.

Northwest Commercial Evaluation Project, Electric Power Research Institute. Senior Auditor. Performed audits of new commercial facilities requiring detailed data collection of electric loads. Reviewed building plans, interviewed facility managers, and compiled a building energy profile (many buildings were involved in Idaho Power's Design Excellence Award Program).

Measure Cost Study, California Demand-Side Management Measurement Advisory Committee (CADMAC). Performed cost data collection and analysis of various standard and energy efficient technologies. The project developed detailed cost estimates to support utilities in various energy-efficiency planning, evaluation, and implementation activities.

PROFESSIONAL AFFILIATIONS, AWARDS, AND CERTIFICATIONS

American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
CEM: Certified Energy Manager (Association of Energy Engineers);
Association of Energy Engineers (AEE), Member

TAMI RASMUSSEN

EDUCATION

University of California, Santa Barbara, M.A. in Economics, concentration in Econometrics, June 1997

University of California, Santa Cruz, B.A. in Economics, concentration in Natural Resource and Environmental Economics, Phi Beta Kappa, College Honors, Honors in the Major, June 1995

EXPERIENCE HIGHLIGHTS

XENERGY Inc, Oakland, California, 1997-Present
Senior Energy Analyst. Performs a variety of quantitative and qualitative research in support of energy-efficiency consulting projects. Oversees a variety of market research efforts, developing survey instruments and directing survey implementation. Provides analytical support for impact evaluations, market effects studies, and process evaluations for utility DSM programs. Performs data cleaning and validation for residential appliance saturation surveys and derives end-use energy consumption estimates for utility planning and market research. Performs quality control on billing disaggregation for residential utility customers. Conducts economic analyses and cost/benefit calculations in support of green building assessments.

Treese and Associates, Santa Barbara, 1997
Analyst. Performed competitive analysis for leading telecommunications firm. Researched major telecommunications firms and assessed the strength of their various market positions.

Office of Regional and Economic Development, University of California, Santa Cruz, 1995-1996
Analyst. Performed cost analyses for University of California Monterey Bay Education, Science and Technology (UC MBEST) Center marketing plans. Organized and participated in series of regional economic development meetings in the greater Monterey and San Francisco Bay region. Investigated and prioritized funding opportunities for the Center.

Roberta Hunter and Associates, Environmental- Economic Consultants, 1995
Analyst. Performed data analysis on regional surveys regarding proprietors' preferences for various economic growth opportunities being considered by the County of Santa Cruz. Gathered data on the economic effects of the Monterey Bay National Sanctuary status designation realized by the County of Santa Cruz, and developed recommendations for capturing more benefits from the designation.

FIELDS OF SPECIAL COMPETENCE

- Environmental and natural resource economics
- Econometric modeling: regression analysis, qualitative choice modeling
- Conducting market research studies
- Conducting process evaluations
- Developing data cleaning and validation routines

- Desktop GIS mapping
- Statistical Software: SAS
- RECAP™ residential energy analysis software program (VAX and PC-based)

MAJOR PROJECTS

Process Evaluation of State of Wisconsin Focus on Energy Programs. Overall process evaluation of statewide administration of residential, commercial and industrial energy efficiency and renewables programs. Currently conducting interviews with key individuals at the Department of Administration. Developing recommendations for improving administration of programs that span the entire statewide public benefits effort.

2001 Low Income Energy Efficiency (LIEE) Program Evaluation: Impact and Process Evaluation. Currently managing data collection in support of a process evaluation for the four California investor-owned utilities, assessing the internal processes of each utility's LIEE program in order to make mid-year 2002 program improvements where feasible and to develop program plans for PY2003. Providing analytical support for the development of first-year impacts of the PY2001 program.

Evaluation of PG&E's 1-2-3 Cashback Program. Process and impact evaluation of PG&E's umbrella program that offered its residential customers with conservation tips and rebates on energy efficient appliances and other equipment. Coordinated focus groups in support of developing a consumer survey instrument, and analyzed survey results.

CA Statewide Residential Lighting and Appliance Study. Managed data collection and analysis activities for statewide, multi-phase market effects study of the IOU's lighting and appliance programs. Managed consumer telephone surveys, retailer and manufacturer in-depth interviews, and the development of market characterizations and program descriptions. Performed analysis on time series data and reported on market indicators and evidence of market effects.

CEC Demand Response Guidebook Project: Market Research. Coordinated focus groups and managed in-depth interviews in support of the data collection component of the market research task of this contract. Provided analytical and reporting support.

City of Roseville Forecasting Project. Provided analytical support in developing inputs for City forecasts utilizing utility billing, weather, and parcel data.

2000 Low Income Energy Efficiency (LIEE) Program Evaluation: Impact and Process Evaluation. Managed data collection in support of a process evaluation for the four California investor-owned utilities, assessing the internal processes of each utility's LIEE program in order to make mid-year 2001 program improvements where feasible and to develop program plans for PY2002. Identified areas of best practice across the four utilities by program element, to be used by the utilities as benchmarks for future efforts. Provided analytical support for the development of first-year impacts of the PY2000 program.

Follow-up Study: Southern California Edison. Served as lead analyst for the follow-up to market effects study of SCE's energy centers (CTAC and AgTAC). Analyzed the non-residential population as far as distance from centers, location of various sectors and sizes. Evaluated baseline survey data from market effects study in terms of distance from Centers. Mapped non-

residential population using GIS software, indicating business type, size, and distance from the Energy Centers. Developed recommendations to better serve non-residential population.

City of San Jose- PG&E TEEM UP Project. Served as Project Manager, overseeing and performing data analysis, literature review, and residential program design support. Developed a database of the City's and PG&E's programs and participation levels to support participant and non-participant analyses and focus group development. Analyzed the program database, providing key information to gain a better understanding of the City's residents with respect to environmental and energy efficiency program participation. Performed additional analysis on non-residential billing data, including GIS mapping of small business in the City by various firmographic characteristics. Provided recommendations on how to reach the "underserved" markets identified through this effort.

PG&E ENERGY STAR® General Awareness Campaign. Managed data collection activities and analyzed pre-and post-survey results of general residential customer awareness of the ENERGY STAR label. Performed segmentation analysis on results.

PG&E Measure Saturation/Penetration Compilation. Compiled saturation/penetrations of energy efficiency measures for PG&E. Provided data by various segments and time periods where available.

Evaluating City of Portland Buildings Using the LEED Criteria: Provided analytical support, assisting in compiling a database of LEED measures and whether three commercial buildings and one residential building met each measure. Assessed the economic costs and benefits for the buildings to implement measures in order to meet the LEED criteria. Performed net present value calculations and life-cycle assessments in support of determining cost and benefit streams. Attempted to monetize externality benefits of reducing emissions that would accrue to the region and to society.

Northwest Energy Efficiency Alliance Baseline Study. Served as lead analyst, conducting a baseline study plus provided program feedback for the Performance Tested Comfort Systems (PTCS) venture. Analyzed consumer, contractor program participant, and contractor non-participant survey data and summarizing baseline awareness and behavior with regard to HVAC, ducts, and weatherization services in the Northwest.

Market Effects Study: Southern California Edison. Served as lead analyst, evaluating the effects of SCE's energy centers (CTAC and AgTAC) on commercial, industrial, and agricultural customers. Designed multiple survey instruments to assess general non-residential awareness of the centers and effects on participants of seminars given by the centers. Analyzed non-residential end-use customer, upstream market actor, and agricultural end-use customer data.

1997- present RECAP™ (Residential Energy Consumption Analysis Program): Southern California Edison, San Diego Gas & Electric, Pacific Gas & Electric, Seattle City Light, Southern California Gas Company, City of Anaheim, Roseville Electric. Currently providing marketing and general analytical support on residential direct mail audits and maintenance of project databases.

2000 Residential Appliance Saturation Survey: Portland General Electric Company. Provided general analytical and reporting support, developing algorithms to clean and validate survey responses. Performed data analysis to produce saturation tables for residential appliance holdings. Analyzed trends in appliance holdings, technology saturation, and demographics.

Impact Evaluation: Pacific Gas & Electric Company. Performed statistical analysis for computation of savings attributed to PG&E's 1998 Residential New Construction Program. Created data cleaning and validation routines for water heater meter data.

Implementation of Process Evaluation Recommendations: Hawaiian Electric Company. Served as lead analyst, producing Policies and Procedures Manuals to ensure effective and compliant implementation of utility commercial and industrial DSM programs.

RECAP™ (Residential Energy Consumption Analysis Program) Market Transformation Pilot Project: Performed market research on several groups of residential RECAP participants in order to assess the effectiveness of various market transformation components of the RECAP mail audit. Statistically analyzed resultant data and presented results of telephone surveys in graphical format.

1997 Residential Appliance Saturation Survey: Public Service Electric and Gas Company. Provided analytical support, developed algorithms to validate survey responses. Performed data analysis to produce saturation tables for residential appliance holdings. Conducted statistical analysis to derive end-use energy consumption estimates. Set up formatting for appliance saturation and end-use energy consumption report. Analyzed trends in appliance holdings and end-use energy consumption estimates.

1997 PG&E Industrial Rebate Program Evaluation. Provided general analytical support, such as assessing lighting data, summarizing savings results, and producing verification reports for all sites.

1998 Initial Evaluation of Pacific Power's Direct Access and Portfolio Pilot Programs. Served as lead analyst, performing data analysis on residential and commercial data. Analyzed baseline and post-pilot data and performed statistical testing on the data.

Air Distribution Systems Baseline Study - Northwest Energy Efficiency Alliance. Served as lead analyst, performing statistical analysis of data for 1200 homeowner surveys.

California Board of Energy Efficiency Statewide Baseline Study - SDG&E. Provided analytical support, reviewing recent baseline studies and baseline data. Evaluated the data as far as its relevance, timeliness, and usefulness as a baseline dataset.

Process Evaluation: Hawaiian Electric Company. Acted as lead analyst for process evaluation of Commercial & Industrial energy efficiency programs. Reviewed PUC filings for commercial and industrial DSM programs and drafted a list of commitments made to the commission. Interviewed key staff members to assess policies and procedures and compliance with PUC filings. Evaluated program and marketing documents and suggested modifications to improve effectiveness of the materials. Performed audit on program files and tracking database to assess accuracy of data and to recommend changes to improve clarity and consistency of documentation.

Impact Evaluation: Hawaiian Electric Company, Hawaiian Electric and Light Company, Maui Electric Company. Performed quality control on commercial and industrial lighting audit data and lighting logger data. Analyzed data for incorporation into program evaluation.

Market Segmentation Analysis: PacifiCorp. Served as lead analyst, segmenting market research data on commercial and industrial customers based on market behavior. Performed marketing cluster analysis on survey responses to obtain key market characteristics that might suggest a particular market segment.

PUBLICATIONS

T. Rasmussen, K. McElroy. Mass Deliveries of CFLs as a Response to the Energy Crisis: Evaluation of California's 2001 Compact Fluorescent Bulb Programs, prepared for Pacific Gas &

Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company by XENERGY, Inc.

Lee, A.D., G. Syphers, A. Scott, and T. Rasmussen. Green City Buildings: Applying the LEED Rating System, prepared for City of Portland Energy Office by XENERGY, Inc. and SERA Architects.

PROFESSIONAL ASSOCIATIONS

Women Energy Association

JULIA K. LARKIN

EDUCATION

University of California, Berkeley, Masters of Public Policy from the Goldman School of Public Policy, 1999
University of California, Santa Cruz, B.A. in Modern Society and Social Thought, 1991

EXPERIENCE HIGHLIGHTS

XENERGY Inc, Oakland, California, 1999—Present
Senior Analyst. Performs a variety of quantitative and qualitative research in the areas of energy policy, energy-efficiency, market assessment and market transformation, program evaluation, performance measurement and Internet business strategies. Responsibilities include: survey design and implementation, data collection, quantitative and qualitative data analysis, and market research. Serves on Environmental Sustainability Business Development Committee.

Institute for Urban and Regional Development, University of California, Berkeley, 1999
Research Assistant. Researched best practices for sustainability indicators and community-based indicator projects. Developed an analytical process for evaluating possible indicators addressing sample criteria, data collection and quality and cost issues. Authored comprehensive resource document with detailed recommendations designed to facilitate the development of environmental sustainability indicators for community projects around the country.

Urban Ecology, Oakland, California, 1998
Realize the Vision Intern. Researched best practices for downtown revitalization and retail development projects. Advised local communities on strategic ways to achieve more environmentally sustainable city policies. Organized forum on mixed-use financing for the Progressive Development Network. Developed workplan for a book on translating the Blueprint for a Sustainable Bay Area into city plans, ordinance and zoning practices.

Department of Human Services, City and County of San Francisco, California, 1998
Team Consultant. Researched national program models and best practices for job retention among Temporary Aid for Needy Families (TANF) recipients. Analyzed Department's existing programs and San Francisco's unique characteristics and demographics. Co-authored policy analysis paper outlining specific recommendations on the development of job retention strategies for San Francisco's Welfare-to-Work population.

Survey Research Center, University of California, Berkeley, 1991—1992
Survey Worker. Conducted research interviews by phone using CATI. Studies for the U.S. Department of Labor, Employment Development Department of California, and academic researchers addressed the following: abortion, affirmative action, Congress, HIV/AIDs, Supreme Court, unemployment and workplace attitudes.

FIELDS OF SPECIAL COMPETENCE

- Policy Analysis and Development
- Microeconomic Analysis
- Multivariate Statistical Analysis
- Survey Design and Implementation

- Indicator Development and Performance Measurement
- Energy & Environmental Conservation Practices
- Community and Municipality-Based Initiatives

MAJOR PROJECTS—XENERGY

Beyond Commodity: Quantifying the National Market for Nonresidential Energy Services. Confidential Clients. Performed data analysis on 301 CATI surveys examining awareness of selected energy services, offers of services, recent purchases of services, future purchases of services, and perceived competitors. Authored results sections of report and supporting documentation.

Statewide Evaluation of Large Nonresidential Standard Performance Contracting Program. Managed data collection and data analysis on a study of statewide California programs to increase energy efficiency of large nonresidential customers. Designed interview instruments, managed data collection, and analyzed data. Authored chapters highlighting findings for Program participants and national baseline study.

Statewide Small Nonresidential Customer Market Transformation Program Assessment. Managed data collection and data analysis on a study of statewide California programs to increase energy efficiency of small nonresidential customers including the Small Business Standard Performance Contract and Express Efficiency Program. Designed interview instruments, oversaw survey implementation and analyzed data for participants. Authored key sections of Phase II Report highlighting interim findings and providing program recommendations. Assisted in preparation of Final Report.

Market Effects Study of Residential Energy Efficiency Mortgages. **Staples-Hutchinson and Associates.** Developed and conducted surveys for real estate agents, lenders, and homeowners for evaluation of PG&E-sponsored program to accelerate the adoption of EEMs in HUD and FHA financed housing. Performed qualitative and quantitative data analysis and database management. Wrote sections on methodology and results of lender surveys.

Energy Efficiency in the Biotechnology Industry. Pacific Gas & Electric Company. Conducted market research and telephone interviews with industry professionals and trade allies regarding energy efficiency in the Biotechnology industry.

Evaluation of Commercial/Industrial Process Overhaul Program. Pacific Gas & Electric Company. Conducted research interviews by telephone with end-users on evaluating effectiveness of motors/drives and compressed air systems seminars. Researched the market for compressed air systems. Wrote a market characterization for compressed air systems in the PG&E service territory.

Understanding Utility Internet Strategies. Confidential Clients. Conducted content surveys and in-depth reviews of web sites for regulated utility companies and unregulated energy companies. Performed data analysis on 97 website surveys, and over 700 residential and small business consumers. Participated in three-person team that developed a taxonomy to classify Internet business strategies and drafted a report summarizing key findings and detailing recommendations to regulated utilities on appropriate Internet business strategies.

MAJOR PROJECTS—PRIOR TO XENERGY

Community and Economic Development Agency, City of Oakland, California. Developed framework for designing a Sustainable Oakland Website for the City of Oakland. Collected, synthesized and organized data for a variety of issues including environmentally responsible businesses, organic produce sales, community gardens, parks, and recycling opportunities in the city. Aided in design and drafted portions of text for a pilot Sustainable Oakland website.

Oakland Sharing the Vision, Oakland, California. Coordinated committee of city staff, environmentalists and community members facilitating community participation in a new environmental component of Oakland's community-based Strategic Plan. Evaluated city plans and interviewed key city staff, business and community members to determine environmental priorities and opportunities for improvement. Drafted materials for community workshop focusing on the environmental component of the Strategic Plan.

REPORTS, PUBLICATIONS, AND PRESENTATIONS

Lee, A.D., J. Larkin, M.K. Gobris, B. Thompson, and J. Staples. *Market Effects Study and Evaluation of PG&E's 2000 Time of Sale Energy Renovation Program*, presented to the Tenth International Energy Program Evaluation Conference, August 21-24, 2001, Salt Lake City, Utah.

Lee, A.D. and J. Larkin. *2000 Market Effects Study of the TOSER EEM Program Final Report*, prepared for PG&E and Staples-Hutchinson. March, 2001.

Rufo, M.W., J. Larkin, and J. Cavalli. *Beyond Commodity: Quantifying the National Market for Nonresidential Energy Services,* prepared for Confidential Clients under XENERGY's Retail Energy Markets 2000. February, 2001.

Rufo, M.W., J. Larkin, and R. Bordner. *1999 Nonresidential Large SPC Evaluation Study Final Report*, prepared for SCE by XENERGY, Inc. January, 2001.

Larkin, J., M.W Rufo, and A.D. Lee. *Understanding the Small Business Market for Energy-Efficiency Services*
presented to the Association of Energy Services Professionals 11th National Energy Services Conference, New Orleans, Louisiana, December, 2000.

Rufo, M.W., A.D. Lee, and J. Larkin. *1999 State-Level Small/Medium Nonresidential MA&E Study Final Report*, prepared for Pacific Gas & Electric by XENERGY, Inc. December 2000.

Larkin, J. "Bringing It Home: Developing Effective Community Sustainability Indicators for Energy," presented to the American Council for an Energy Efficient Economy Summer Study, Monterey, California, August 2000.

Lee, A.D. and J. Larkin. "Making Energy Efficient Mortgages Work—Market Effects of a California EEM Program," presented to the American Council for an Energy Efficient Economy Summer Study, Monterey, California, August 2000.

Rufo, M.W., M. O'Drain, A.D. Lee, J. Cavalli, and J. Larkin. "Market Assessment and Evaluation of California's 1999 Small and Medium Nonresidential Energy Efficiency Programs," presented to the American Council for an Energy Efficient Economy Summer Study, Monterey, California, August 2000.

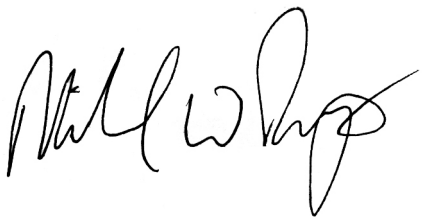
Rufo, M.W., A.D. Lee, and J. Larkin. *1999 State-Level Small/Medium Nonresidential MA&E Study Second Interim Report*, prepared for Pacific Gas & Electric by XENERGY, Inc. May 2000.

Lee, A.D. and J. Larkin. *Time of Sale Energy Renovation Program Assessment and Market Effects Study*, prepared for PG&E by XENERGY, Inc. March 2000.

Larkin, J. *Toward Community Environmental Sustainability Indicators for Oakland*, May 1999.

SIGNATURE PAGE

I, Michael W. Rufo, certify that I have read this document and know its contents; that to the best of my knowledge, information, and belief, formed after reasonable inquiry, the facts are true as stated; that any legal contentions are warranted by existing law or a good-faith argument for the extension, modification, or reversal of existing law; that the document is not tendered for any improper purpose; and that I have full power and authority to sign this document.



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July 2, 2002

CERTIFICATE OF SERVICE

I certify that, in accordance with the Commission's Rules of Practice and Procedure, I have this day served a copy of Response to ALJ Thomas's Ruling Of 6/17/2002 Regarding Evaluation, Measurement and Verification of Local Energy Efficiency Programs, EM&V Qualifications and Notification of Interest by XENERGY on all parties identified on the attached service list. Service was effected by one or more means as indicated below:

- Placing the copies in properly addressed sealed envelopes and depositing such envelopes in the United States mail with first-class postage (via first class mail);
- Placing the copies in sealed envelopes and causing such envelopes to be delivered by hand to the office of each addressee (via courier);
- Transmitting the copies via facsimile, modem, or other electronic means (via electronic means).

Executed this 2nd day of July 2002, at Oakland, California.

Michael W. Rufo

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